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ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart., C.B., Vice-President, in the Chair.

IMPROVEMENTS IN LIGHTS FOR SIGNALLING AND OTHER NAVAL AND MILITARY PURPOSES.

By A. M. SILBER, Esq.

MR. President, by the kind permission of the Council, I am enabled to place before this important Institution a description of certain improvements in burners and accessory apparatus for the production of artificial light, with especial reference to the use of such light for various naval and military purposes, as for signalling, and for the side, the masthead, and the interior lights of ships. Before I proceed to these particular applications, it will be necessary for me to ask your attention, by way of introduction, to some brief observations of a more general character.

Seven or eight years ago, when I commenced my inquiries into the merits and demerits of the then accepted methods of obtaining artificial light, from vegetable or animal oils for domestic purposes, my first discovery was that these methods had remained substantially the same, and without improvement, for a century. I have read that the first lamp on record was formed by drawing a skein of some material through the body of an oily fish-eating bird, and by then lighting this skein either at the beak or at the caudal extremity. A step in advance of this was the lamp with which we are familiar as one of the ordinary articles found in ancient tombs an oval vase or oil-container, flattened on the top, furnished with a handle at one end and with an opening for the emergence of the wick at the other, and with an opening on the upper surface, through which oil could be supplied to the interior. Almost precisely like this in principle, and not very widely different from it in detail, is the common metal lamp in which the opening at the top is closed by a screw plug which carries a small tube for the passage of the wick; and this lamp, when required for out-door use, is inclosed within a case with

sides of glass or transparent horn, and then is called a lantern. Our ancestors of a hundred years ago had for a long time remained stationary at this point; but then came a great improvement, effected by Amy Argand, who replaced the rope of loosely twisted cotton, which had hitherto served as a wick, by a cylinder of woven cotton, which was surrounded by a chimney, and which permitted the free access of air to the interior as well as to the exterior of the frame. By this invention Argand obtained a brighter light than had been seen before; and his burner was very generally adopted for indoor lamps of the more expensive kinds, or for certain special purposes. I am unable to say how Argand was led to the discovery which has made his name a household word; but I suspect that it was more by accident than by research. If it had been by research, I think he could hardly have failed to carry the principle farther than he did, for he left his burner subject to the curious disability that its size could not be increased beyond a diameter of seven-sixths of an inch without total loss of all the advantages of the construction. It is not improbable that if this great physicist had made further experiments with his burner, he would have discovered that the upper part of the flame which it gives is insufficiently supplied with air, that is to say, with oxygen; and that for this reason a moderator lamp, fitted with the best form of the original Argand burner, as in the one now before you, gives only the light of one candle for each 65 or 66 grains of oil that it consumes per hour. As a contrast to this an Argand burner, when fitted with my central tube and obtaining from it a proportionate air current, consumes only 49 grains of oil per hour in order to afford the same amount of light. After Argand's time research certainly slumbered, and the only improvements made in lamps for burning animal and vegetable oil for domestic purposes were in trifling matters of mechanical construction, which had no intelligent relation to the quality or the nature of the combustion. Contrivances were introduced for forcing up the oil to the wick, or for keeping it at the same level as it diminished in quantity, as in the moderator or clockwork movements, or for placing the oil-container so that it cast no shadow upon a table, or for replacing a long wick which required winding up as it was consumed by a short one, which was changed whenever the lamp was trimmed. The shapes of the chimneys were also altered in various ways so as to influence the manner in which the air gained access to the flame, and in some lamps a cone of glass or metal was placed above the wick. With these exceptions nothing was done, so that from the dawn of history until the latter part of the eighteenth century, our ancestors were satisfied with a lamp which was practically a liquid candle, consisting of a loosely twisted rope of wick surrounded by fluid fat which it raised by capillary attraction; and from the latter part of the eighteenth century until now, as far as regards the burning of vegetable oil for domestic purposes, there was only one advance upon this liquid candle in the shape of the small circular burner, which received the name of its inventor, Argand. Apart from domestic uses there have been some improvements, and the elder brethren and the engineers of the Trinity House have generally

availed themselves of these, whether they were made in England or abroad, for the sake of improving the illumination of lighthouses, an endeavour in which they have very fairly succeeded. I also think it right to pay a tribute to the Board of Trade for the part taken by the department and its officers in working towards the attainment of efficient lights for ships.

It would carry me far beyond the limits of my available time to-night if I were to attempt to place before you, in any minuteness of detail, the nature of the changes which collectively constitute combustion; but I must crave your indulgence for a few moments while I speak of the broad principles. I am well aware that these principles must be familiar to my audience, but for the sake of completeness I can hardly avoid some brief reference to them. Combustion, then, depends upon a chemical union between the oxygen of the atmosphere and the hydrogen and carbon which are contained in the several substances used as fuel, such as solid fat, animal, vegetable, or mineral oil, or gas. The combustible solids and liquids, however, are not combustible while they remain in their solid or liquid forms, but only when first brought into the state of gas; and the function of the wick in a lamp or candle is to elevate the fluid fat to the flame by capillary attraction in such quantity that it may be volatilised by the heat, and thus brought into a state for combustion. Gas, as opposed to the fats, does not require a wick only because it is already in a state to be consumed, and can be delivered into the flame in sufficient quantity by the agency of pressure alone. Assuming the fuel to be a pure hydro-carbon, the products of complete combustion would be carbonic acid and water only; but if the fuel is impure the impurities may form other compounds of various kinds, some of which, especially some of the gas-products, may be highly destructive to many organic substances, and even to the health of the human body. Besides the incompleteness of combustion which may be due to the presence of such impurities, there is another form also which is of very general occurrence, and which depends upon a departure from the correct proportion in which the atmospheric air and the fuel should respectively be present in the flame in order to unite. It is manifest, or at least it becomes manifest when stated, that if the fuel should be present in excess, the combustion cannot be perfect. If the fuel be in a gaseous form, either at ordinary temperatures or in consequence of exposure to the heat of the flame, any excess which may be present may escape unburnt, and may be diffused abroad in the surrounding atmosphere, while, if the fuel be in a liquid form, the excess will either drown the flame and extinguish it, or, if not in sufficient quantity for this, will undergo only partial combustion or decomposition, forming products which may either be volatile and thus capable of diffusion, or which may remain and clog the fibres of the wick in such a manner as to impair its conducting power. We see all these results constantly produced in common flames. We have gas escaping only partially burnt or in various sulphur compounds, all being injurious to those who breathe them, and some being destructive to books, pictures, and furniture. We have petroleum escaping unburnt and

producing its characteristic odour in the room, and we have all ordinary lamp-flames flagging after a short time from the exhaustion of the conducting powers of the wick. The whole matter may almost be summed up by saying that, if we have too much fuel for the air-supply the oxidation and combustion of that fuel are necessarily incomplete, and if we have too free an air-supply for the fuel the temperature of the flame will be reduced by the air-current, and the combustion will be rendered imperfect in that way.

Prior to the commencement of my own experiments, the regulation of the fuel supply had been the only matter which had engaged attention. There is an apparent exception in the case of Argand, who brought his air-supply to the inside as well as to the outside of a flame; but the exception is apparent only. An Argand burner, properly explained, is nothing more than a slit, or a line of openings, bent round into the form of a ring; and the chimney, although it serves to quicken the air-supply, to steady it, and to send it in two definite directions, has little or no designed influence upon its quantity.

When a naked flame is burning in the open air, it is liable to be so suddenly cooled by currents that the temperature necessary for combustion cannot be maintained, and the flame is said to be "blown out." When it is burning in an inclosed space, as in an ordinary room, it is subject to the action of air-currents in a less, but still in a marked degree; insomuch that its variations of position and direction furnish the most delicate tests by which the presence and the course of currents can be determined. The air which feeds the flame finds entrance into the room by various channels, designed or accidental, and it enters with a certain velocity, which, when resisted by the presence of any substance against which it strikes, becomes converted into pressure, which, in its turn, may again initiate movement. When, however, the air which enters a room through a small aperture or apertures is colder, and consequently of greater specific gravity, than that which the room already contains, the former, by expansion, loses both its velocity and its power of exerting pressure; and it then becomes mingled with the air around it by a process of gradual and insensible mixture, according to the law of the diffusion of gases. We have, therefore, three conditions of in-coming air: the rush of a moving current, the pressure of an arrested current, and the imperceptible and gentle mingling with its surroundings of the current, the force of which has been consumed in the production of expansion. In an ordinary room, well warmed, the entering air is usually cold enough to be distinctly more dense than that which the room contains, and it rushes in through various chinks furnished by imperfectly fitting doors and sashes. The velocity of the entering currents is gradually arrested by the resistance of the comparatively stationary air which they meet, and some of their force is expended in producing their expansion; so that, before they reach a point very remote from that of their entrance, they are brought to rest, and become subject to the law of diffusion. When the air around a flame is moderately still, the flame feeds itself by its heating action, which causes the ascent of the air above and around it, and an equable lateral flow from all sides to take the place of that which is thus re-

moved. Under ordinary circumstances, this equable flow is only sufficient to support a somewhat sluggish rate of combustion; and the effect of the chimney of an Argand burner is to accelerate the upward movement by restraining it laterally, and thus to accelerate also the lateral flow by which the flame is supplied with oxygen. If a violent commotion is produced by opening a door or window, or if a flame be placed exactly in the track of an entering current before the force of this is exhausted, in either case the flame will be fluttered and disturbed; the rush of air past it being too great for its requirements, and sufficient to lower its temperature injuriously. Such conditions, however, are only of momentary or occasional occurrence; and, in all ordinary circumstances, the atmosphere of a room is so quiet that its few perturbations may be disregarded, and the burners for the production of light may be satisfactorily constructed upon the hypothesis that the air around them will be in a state of equilibrium, with a supply just sufficient to balance the consumption. To make a perfect burner for these conditions, it is only necessary to provide for the measurement, by a definite inlet, of the quantity of air which is admitted to the flame, as well as of the quantity of fuel, and to provide also for the distribution of this air in the manner and direction which are most desirable. It was formerly believed by gas engineers that a better flame was produced in Argand burners by what is called "throttling" the gas; that is, by compelling it to pass through very fine openings or channels before it was delivered into the burner, with a view to take off the effects of the pressure from behind, but it has recently been shown that this belief has no foundation. I have here a burner fitted to an ordinary half-inch pipe; and you will observe that its action is in no way different from that of one which is throttled in the ordinary manner. The simplest form of burner for perfect combustion is shown in my tubulated gas-burner, in which the supply of gas is regulated by a common tap, and the air-supply, partly by this square opening and partly by variations in the height of the chimney, according to the amount of light which it is desired to obtain, and so that the air and the fuel bear a constant and definite relation to one another. In order to provide for the proper distribution of the air, this pipe is inserted within the burner, in the centre of the flame; and it gives the in-coming air a definite direction towards the place where it is required. In the common Argand burner, as soon as a certain diameter is exceeded, the flame wavers and becomes feeble, because the mid-channel is then so large that the entering air may pass upwards clear of the flame, and without feeding it; but the internal tube, or, in large burners, a series of concentric tubes, causes the air to feed the flame, however large may be the circle of the burner, and has enabled me to make burners with a single wick, for the consumption of vegetable or mineral oil in lamps for domestic purposes, of any diameter that may be desired, as shown in the specimens now before you. You will observe, moreover, that the air, before it reaches the flame, passes through so much metal work that it becomes heated, and hence does not lower the temperature of the flame in any material degree. Finally, the chimney, by which the

flame is inclosed, serves as a shield against the pressure of transient air-currents, and maintains a sufficient degree of steadiness for all ordinary purposes. A burner thus constructed, placed in an ordinary sitting-room, is liable to occasional and momentary perturbations, from sudden draughts, the opening and shutting of doors, and so forth, but its usual state is one of great quietude, during which the gas supplied to it is perfectly consumed. The practical result is, that for the same consumption of gas it gives more light than the best Argand which previously existed; and also that, because it consumes all, or nearly all, of the gas supplied to it in light giving, it leaves little or none to go free, either unconsumed or partially consumed, in the form of noxious compounds. Another result of the perfect combustion is, that the light more closely resembles sunlight in its quality than does any other which has been produced. I am informed by Professor Barff that its prismatic spectrum is nearly identical with that of the solar ray; and it certainly allows nearly all shades of colour to be distinguished as if in the day-time.

In gas-burning, where the fuel is already in a state fit for combustion, the problem of affording the best attainable light-giving flame is presented to us under its simplest form; and the application of the same principle to the consumption of oil has required certain modifications of detail. The chief object of these has been to prevent the premature destruction of the wick: and this has been accomplished by keeping the level of the oil below the flame, so that the upper part of the wick shall never be drowned in fluid; and next, by making the wick stand free, and clear of contact, between two metal cylinders, so that it shall not be scorched by the hot metal itself. By attention to these points the burner now before you was obtained. It may be used, with slight alteration, for either vegetable, animal, or mineral oil, and its advantages over most others are perhaps so manifest that they scarcely require to be pointed out.

Having thus arrived at the best possible combustion for domestic purposes, the next subject for inquiry was how the same principles could be applied to oil lamps which were required to bear exposure to weather. Such lamps are necessarily inclosed in lanterns, and a lantern is practically the same thing as a small room. It is, however, so small, that the currents of air which enter it have neither time nor space to lose velocity and pressure by expansion, but must strike upon the flame in a forcible manner, disturbing it by all their variations. Such lamps, moreover, are chiefly required for purposes for which the cost, the stowage, and the frequent breakage of chimneys are sources of great inconvenience; and it was therefore very desirable that chimneys should be dispensed with. The problem before me was how to construct a lamp-case or lantern, which should supply the contained oil-burner with precisely the amount of air required for complete combustion, which should render a chimney unnecessary, which should allow the freest exit to hot air and to the products of combustion, but which should be absolutely weather-proof, impervious to water either in the shape of rain or of waves, and so far impervious to wind-waves that their impact should neither diminish nor increase the

speed or the quantity of the air-supply of the flame. It was not sufficient to have entire defence against lateral wind-waves, but defence was also necessary against atmospheric pressure from above or from below, so that the flame might not be affected by hauling up the lantern to the mast-head, or by lowering it from thence, or by downward pressure from waves breaking over the side-lights. I have now the pleasure of placing before you ship's lanterns, intended to be used for mast-head and for port and starboard lights, in which all these requirements are fulfilled. The lamps burn colza oil, and with modifications of construction, would burn petroleum if required. They have no chimneys, and they give the light you see, which, photometrically tested, is equal to that of about fifteen standard candles, and, when reinforced by a reflector and concentrated by a cut dioptric lens, is equal to that of fifty standard candles, and can be seen, on a

FIG. 1.

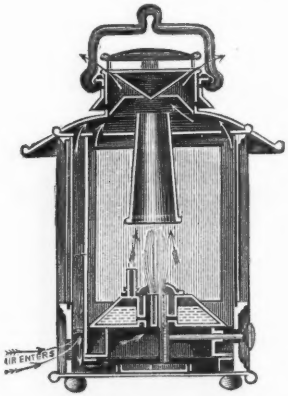
clear night, at a distance exceeding five miles. They burn eighteen consecutive hours with no important diminution of light, requiring only, if the full size of the flame is to be maintained, that the wicks should be turned up a little every six hours, this being done by the milled head on the outside, without opening the door or disturbing the flame. They can be filled and trimmed with great facility by the use of one hand only, leaving the other free for holding on; and, as a new wick is dropped in at each trimming, there is no liability to derangement of the flame from irregular cutting of the old one. My assistant will now take a sheet of metal, and afterwards a large pair of bellows, and will show you that no amount of external wind will cause the flame to be affected to any material extent.

I have next to call your attention to the construction of the lanterns, and I shall explain this most easily by the aid of the large drawings which are here suspended (see figures), and by that of a

special lamp made for the purpose, in which some of the metal parts have been replaced by glass in order to facilitate inspection.

In these drawings, as you will observe, and in the lamp itself which stands before me (Fig. 1), the bottom of the lantern or case consists of a solid plate of metal, which is therefore impervious to air or water; and I may add that the whole of the workmanship is of such a kind as to exclude both air and water at every point where they are not intended to enter. At the back of the lantern there is an air-chamber contained within two vertical plates, here of glass, although generally of metal; and this chamber receives the external air through two vertical tubes, which are each half an inch or more in diameter, and rise to about one-third the height of the chamber itself, into which

FIG. 2.



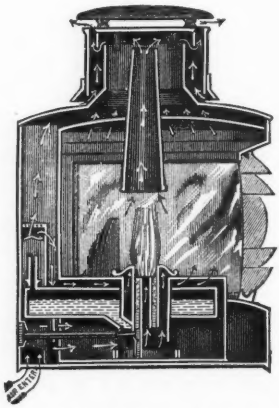
they open freely by their upper extremities. At their lower openings the tubes are covered by wire gauze, which divides the entering current and diminishes its force. At the bottom of the air-chamber, in front, is a horizontal opening or slit, about half an inch wide, for the further course of the air; and this opening leads to a space beneath the lamp, which communicates directly with the under side of the burner, to which, therefore, the entering air is directed (see Fig. 2). If we regard for the present only the question of air-supply, although bearing in mind that there is an outlet above which will require description presently, we shall see that, when the lamp is lighted, what happens is this: the products of combustion and a portion of the air within the circle of the burner, being heated and rarefied, ascend, and make way for more to come in and to occupy the space which would otherwise be left a vacuum. This more is contained in the space beneath the lamp, and is fed in its turn by the contents of the vertical chamber. But the air which enters this chamber through the vertical tubes preserves its vertical direction unchanged until much or all of its velocity has been lost by reason

of its expansion. Then, as it still retains greater weight than the warmer air already in the chamber, it next slowly descends; and, by the time it reaches the lowest level of the chamber, where only it can pass away, it has become subject to the law of the diffusion of gases, and moves onward to feed the flame, as it is required, and in no greater quantity than the consumption or removal of the air in front of it will make way for. In order to show the currents, I will light a piece of paper, and will feed the lantern with this smoke-carrying air, which will render the currents visible. You will observe how they pass upwards with considerable velocity, how soon this velocity is exhausted, how they then curl over and slowly fall, mingling in their descent, until at length they reach the bottom of the air-chamber in a quiescent condition. The principle is, you will observe, that the opening which leads onward out of the air-chamber is of such capacity as to convey no more air than is required for proper combustion; and that the air-chamber itself is a contrivance in which entering velocity and pressure are consumed or wasted, so that there is nothing left of them to exert any influence upon the light. However much the air external to the lantern may be agitated or disturbed, the effect of this agitation is absorbed and lost before the air reaches the channels which lead directly to the flame.

I pass on now to the consideration of the mode of exit of the products of combustion, and to the precautions which prevent the exit openings from becoming inlets either for water or for air. It is manifest that such precautions are required in practice to be very complete; and also that they have to meet different conditions under different circumstances; some lanterns being only exposed to the impact of currents of air which are horizontal or nearly so, that is to say, to wind striking them either horizontally or with a slight degree of obliquity, while others are exposed also to direct downward pressure, as when a mast-head light is hauled up quickly to its place, or when a wave breaks over a port or a starboard light. In the last-named case, when a wave curls over the top of a port or starboard light before falling upon it, the water compresses the air in its descent, and drives down beneath it a cushion of compressed air against the top of the lantern, while the pressure of this compressed air may be instantly followed by the powerful impact of a heavy mass of water. In order to meet these different conditions, I have two different tops, one calculated to resist the velocity of lateral currents, the other calculated to resist vertical pressure also; and in the side lanterns there is an additional provision against the ingress of water. The specimen lamp before me has only the top for velocity, the lantern being one of a class which is intended to be hung up overhead, in engine-rooms, passages, or other draughty places, but which is neither to be fixed to a ship's side nor hauled quickly to a height. I may point out in passing, that the weight and dimensions of the oil-container are such that it can be taken out and replaced with one hand, a feature in which it differs for the better from many of the engine-room and other overhead lamps now in use in the Navy. By reference to the diagram, or by looking at the lantern itself, you will see that there is above the flame an

inverted metal funnel, which serves to collect and guide the ascending currents produced by the heat of the combustion. These currents are thus conducted nearly to the top of the lantern, where they impinge, immediately above the opening of the funnel, upon the apex of an inverted cone, which is contained within this cylinder, and which allows them to pass upwards easily in all directions, and to escape all around it. Above the cone, supported on these three stems, is a horizontal plate, somewhat convex above, and of greater diameter than the cylinder which it covers, so that its projecting eaves prevent any rain or other small amount of descending water from finding its way into the interior of the lantern. The stems which support the covering plate are of such a height as to leave a free passage for air between the plate itself and the base of the cone below it; and hence, in whatever direction a lateral current may strike against the top, it

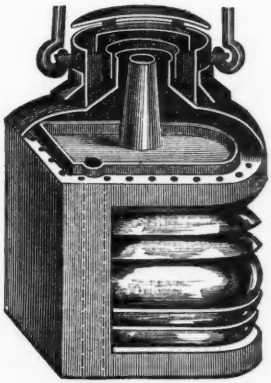
FIG. 3.



passes between the base of the cone and the covering plate, and out on the other side, with less resistance than it would meet in passing downwards by the sides of the cone. The result is, that wind does not pass downwards, but sweeps right through, with no other effect than to carry the heated air and the products of combustion rapidly before it, and thus to increase the brilliancy of the flame. This top is an old contrivance of mine, originally designed for street lamps; and we find that the street lamps which are fitted with it burn with a less brilliant light when the air is perfectly still, so that there is no horizontal current to clear away the products of combustion. A slight lateral movement of the air places them upon their best behaviour, and a gale of wind cannot affect them injuriously. Many thousands of these tops have now been in constant use for more than seven years, not only upon street lamps and signal lanterns, but also upon railway carriage roof lamps; and it is found in the latter that the flame shows little or no disturbance at the highest speeds of express trains, or even

when travelling through tunnels. The tops have also been used for the last five years in the work of laying and repairing submarine telegraph cables, by Messrs. Siemens Brothers, by Hooper's Telegraph Company, by Henley, and others; in this work the lanterns, burning mineral sperm oil, have constantly been affixed to buoys in very rough weather; and I have not heard of a single instance in which their light has failed. I convert the velocity top into a pressure top by the series of openings shown in this diagram (see Fig. 3), and which you will observe here in the mast-head lantern. Any air which may penetrate into the roof cylinder in a direction from above downwards, will find a more easy way through these openings than into the interior of the lantern, where its entrance would be resisted by the elastic column of hot air on its ascent. A small amount of water, if such were accidentally introduced, would also find exit harmlessly by the same openings.

FIG. 4.



In order to provide against a larger inflow of water, such as might possibly be forced into the top of a side lantern by the breaking of a wave, I have placed an outlet tube from this roof of the main chamber down through the body of the lantern (see Fig. 4), with a ridge of metal to direct any entering water towards it. The tube is of such a size as to afford an exit equal to, or greater than, any possible inflow; and the port and starboard lights, thus protected, may be exposed to the full force of any waves which sweep over them, without the slightest risk that they will be extinguished.

Returning now to the specially constructed lamp, you will observe that it is fitted with these wing reflectors, which are intended, when it is suspended in the engine-room, to cast light upon the places beneath which would otherwise be in the shadow of the bottom of the lantern. When desired, however, the same principle of air-supply may be adapted to a lamp in a glass case, like that of a railway roof lamp, by

which no downward shadow will be produced. Should time permit, I will endeavour presently to explain how this may be accomplished.

Besides the overhead lamps of the pattern shown, I have here three smaller sizes, a larger one for passages, another smaller than the foregoing, for lighting up gauges, and a hand-lamp. The last is fitted with a bull's-eye in front and with two glass sides.

I have already mentioned that the larger or pattern lamp gives a light equal to that of fifteen standard candles as you see it before you; and that this becomes equal to that of more than fifty standard candles when aided by a reflector and by a lens of the best kind. It is desirable, of course, that the mast-head light, and the port and starboard lights, should be clearly seen at considerable distances; and for them, therefore, the reflector and the lens are necessary appendages. The lenses, if of the best kind, are very expensive, and they are liable to crack if heated and then suddenly cooled. During the use of the light they must, of course, be heated to a certain degree; and they are always liable to be suddenly cooled, and thus broken by rain or spray. For the mast-head and side lanterns, therefore, in order to preserve the lenses, I have sacrificed something of the steadiness of the light. I have done this by making perforations in such a way that in these lamps the whole of the air does not pass from the air-chamber to the space underneath the lamp, but a certain part is allowed to go through the openings shown in the drawing (Fig. 3), which conduct it over the oil-container to the outer side of the flame. The effect of this is that a constant current of comparatively cool air passes over the oil-container, and then upwards between the lens and the flame, and by this means both the oil and the lens are kept much cooler than would otherwise be possible. To keep the lens cool must always be important, and to keep the oil cool will be equally so if ever any of the mineral oils should replace those vegetable oils which are at present preferred. To this subject it will be necessary to return hereafter.

The lenses in common use for signal lanterns are of three kinds, the cut, the cast, and the blown, and the prices of these three varieties differ somewhat in the ratio of pounds, shillings, and pence. The object of the lens, of whichever kind, is to refract the rays of light in such a manner that they shall be spread out in a horizontal direction, and not diffused upwards or downwards. The result is, of course, that they are visible over a much larger angular aperture than if they were evenly diffused. The international maritime regulations require the mast-head lights of all sea-going ships to be visible over an arc of the horizon of twenty points of the compass; a requirement for the fulfilment of which a lens is practically indispensable, and it will be for the authorities to consider whether the cheaper varieties are sufficient for the purpose. The three varieties produce effects which are almost proportionate to their prices, and the reason is that the blown and the moulded lenses are composed of glass which is neither optically homogeneous nor truly curved, and that, by both these faults, much of the light which they receive is diffused irregularly or otherwise wasted. The cut lenses, on the contrary, may be relied upon for correct performance, and send in the desired direction the whole

of the illumination which the flame and the reflector supply to them.

Having satisfied myself that the lanterns which I have already placed before you were likely to fulfil the purposes for which they were designed, my next endeavour was to improve lanterns as a means of signalling by flashes. For this purpose I have added to a small mast-head lantern a simple mechanism for covering and uncovering the flame. This mechanism consists, as you may see, of a pair of curved metallic shutters, which are pivoted at the anterior extremities of the posterior third of the circle of the burner, and which either fall back, so as to reveal the light over the required number of points, or close up so as to conceal it entirely. The shutters are moved very rapidly by a rack and pinion to each, and the two racks are moved in their turn by a single button at the back of the top of the lantern, as now before you. To this button, when necessary, a cord may be attached by a bell-crank arrangement, so that, if the lantern is at the mast-head, the shutters may be opened and closed from the deck. I have also made smaller lanterns, intended to be used for hand-signalling, either at sea or on shore, in which the light is covered or exposed by the rising and falling of a single shutter, moved from the handle by a simple lever arrangement, acted upon by the thumb of the hand in which the lantern is held. In these the velocity or pressure tops can be removed and replaced by saucepans, in which food can be either cooked or warmed without any display of the light. This apparatus, either in the larger or in the more portable form, will be found well adapted for the requirements of the Morse code, which seems to be in some respects the best, as being popular, easy to learn, and lending itself readily to cipher correspondence. It has also the advantage of being in use in the Army, so that it would at present afford greater facilities than any other system for opening communications between ships and bodies of men on shore. I cannot help thinking that every able seaman should pass an examination in the Morse code before obtaining his certificate, by which plan it would soon be understood throughout the Navy. Still, it is not my business to pronounce upon the merits of different systems, neither am I wedded to any; and these lanterns will suffice equally for all. Either upon sea or upon land they afford a far-reaching light, they require little attention, they are weather-proof, and the light can be obscured or revealed in an instant by this simple arrangement, in which there is nothing liable to be broken or deranged in ordinary circumstances. The light can be kept entirely concealed except at the moments when signals are being sent, and the lantern will fulfil all the purposes of a cooking stove, and may thus render a bivouac fire unnecessary.

There is yet one other form of ship's lamp to which I would briefly call your attention; and that is, an engine-room lamp to hang overhead, but little modified from the old service pattern, and yet constructed upon my principles, after a plan originally devised for railway carriage roof lamps. It has the advantage of a perfectly transparent base, in which there is nothing to cast a shadow below; and it occupies less room than the lamp with wings, already before you, in which the

shadow is diminished or overcome by lateral reflection. The burner of this lamp is contained within a double glass basin, and is placed upon an opening in the inner basin; so that the space between the two fulfils the purpose of my air-chamber, and allows the force of the entering air to expend itself before it reaches the flame. Such lamps may be fitted with tops either for velocity alone or for pressure and velocity combined; and I have a second pattern also, something of the same external appearance, in which the glass bowl is single. The chief disadvantage of these is that they require glass chimneys; but, in order to reduce this disadvantage within the smallest limits, I have attached the glass chimneys to metal tubes, so provided with projecting collars that the glass portion is stopped from coming into contact with the other metal work of the lamp when it is being inserted, or when it is in its place; and is also stopped from coming into contact with the ground, or with a table, when it is withdrawn and laid down. By this arrangement, while a brilliant light is given, the chances of breakage are rendered extremely small.

The lamp thus constructed is a decidedly ornamental one; and would, at first sight, seem to be as suitable for a saloon as for an engine-room. This, however, is not quite the case; and for saloons I recommend lamps of the moderator pattern, which may be fitted with my burners, and which carry their oil in a receptacle below the flame. Oil, like other things, expands when heated; and this expansion is a common cause of overflow and leakage from lamps in which the oil container is above the flame. We often see this in railway roof lamps; and nothing is more unsightly than to have an overflow of oil into the glass basin, washing to-and-fro with every roll of the vessel.

Before I take leave of my lamps, I must mention another quality which they possess, and which all naval men, I believe, will admit to be an important one. The position of the oil-container, in reference to the flame, is such that the heating effect of the latter, although never excessive, is yet always sufficient to preserve the oil from congelation. Instances have not been wanting, as I am informed, in which lamps at the mast-head have been extinguished by the freezing of their oil.

I would also say a final word on the question of trimming these mast-head and side lights, which only require the wick to be turned up from outside every six hours. The light is in no way interfered with while this is being done; whereas, as I am told, collisions at sea have more than once been occasioned by the temporary withdrawal of a light for the purpose of trimming it, and during the few minutes which were occupied in the process, I therefore put forward the length of time during which my lamps will burn as a property which alone contributes to their value in a very appreciable degree. I mention this with the more satisfaction, because the result has been obtained by much thought and labour, and after some complete and many partial failures. In 1873, the Board of Trade presented to Parliament a report upon the performances of various lamps; and in this report it is said of mine, as they were then made: "This light is too com-

"plicated, cumbersome, and expensive, ever to be an efficient ship's "light. The length of time it requires for trimming is very objec- "tionable, being nearly double that of any of the other lanterns under "trial. It also involves a greater amount of attention, requiring "trimming and refilling every three hours, which is much against it "as a ship's light. After being first lit and properly trimmed, it gives "a most brilliant light for about two hours, after which the light "becomes exceedingly indifferent until the lamp is again trimmed. "I should exclude this light as altogether unfit for use as ship's "lights." The reports made since then have been of a very different character; and, what is of still more importance, after I had been permitted to place lamps experimentally on board some of the ships of the Channel Squadron, the Admiralty not only desired to keep them, but also to be supplied with more.

I think it will be fair, at this point, to invite your attention to a comparative statement of the light-giving power and the oil-consumption of the lamps now in use in the Navy, as contrasted with my own. The Table here suspended exhibits the results of an examination made by Mr. Valentin, at my request, of the performance of Navy lamps which have been borrowed from the Admiralty; it will be seen that, light for light, my lamps effect a saving of from 33 to 54 per cent. The largest lamp, burning the best colza oil, and with the aid of reflector and lens, gave the light of 8·70 candles, and consumed 50·60 grains of oil for each candle per hour. The square engine-room lamp gave the light of 5·35 candles, and consumed 94·8 grains of oil per candle per hour. The gauge lamp gave the light of 1·99 candles, and consumed 1·24 grains of oil per candle per hour. The performances of my own lamps are shown side by side with those of the others; and as a parallel set of facts, I have here, obtained from Professor Barff, who conducted the experiments, the results of a competitive trial of railway roof lamps, which was undertaken by the Society of Arts. The best chimneyless lamp burning colza oil, excepting my own, gave a light below that of four candles, and consumed 116 grains of oil per candle per hour; while mine gave a light of sixteen candles, and consumed only 68 grains of oil per candle per hour.

I have already mentioned that my lamps can be arranged to burn either vegetable or mineral oil, and these which you have as yet seen all burn colza. I entertain strong objections to the use of petroleum on board ship, and that for various reasons. In the first place, petroleum oil has a great tendency to soak into any woodwork on which it may be spilled, and to render it highly inflammable. A lamp-room on board ship, in which petroleum is used, is very liable to take fire; and I may remind you that this actually happened not long ago in a training-ship in the Thames.

In the next place, in foreign countries, from whence, in the common course of things, supplies must sometimes be obtained, there is not the security for the quality of the oil which is afforded by the Petroleum Act at home; and hence oil of a dangerously light and inflammable character would sometimes be taken on board.

Lastly, even with oil of the English standard, and still more, of course, with any lighter variety, there is always a risk lest it may be overheated in common lamps, and may overflow, being kindled in its way, and descending in liquid fire. Notwithstanding these grave objections, I have little doubt that the cheapness of petroleum will in time secure its introduction into the Merchant Service; and, if this should ever happen, its use should only be permitted where certain precautions are strictly enforced and where it is burned in the safest possible way. It has been suggested to me that, in order to avoid soakage, the walls of the lamp-room might be of metal, and its floor covered by a layer of concrete. Returning to my more immediate subject, I have here two ship's mast-head lamps which burn petroleum, one with a chimney, which gives, when photometrically tested without a reflector, a light equal to that of seventeen standard candles; and one without a chimney, which gives, when tested in the same manner, a light equal to that of seven standard candles. I would now direct your attention to the experiments made with petroleum lamps, with a view of ascertaining the temperature of the oil after several hours' burning, and which you will perceive is only slightly higher than that of the atmosphere where the lamps were tested. This result has been obtained by placing a simple air-jacket around the oil-container, so that air may circulate freely around the oil. The jacket and the oil-container are connected only by one brass tube, which also serves as a socket for the chimneyless burner. In the larger burner, the connection between the two chambers is still more slight; so that there is scarcely any conduction of heat to counteract the cooling effect of the air-current. The anchor-light, as already stated, gives the illumination of seventeen candles.

And now, Mr. President, it is time for me to bring my discourse to a conclusion. It will be for this distinguished audience, and for naval and military authorities generally, to say whether the work to which I have devoted several years, and much anxious thought, is of a value and importance commensurate with the pains which I have lavished upon it. The question is in reality whether the old methods of lighting and of signalling can be accepted as sufficient for the requirements of the present day, for the enormous increase in the number of the ships by which all seas are perpetually traversed, and for the enormous increase in the individual value of those ships, and in the average number of human beings which they contain. The lamps which I have placed before you are more expensive than the old ones; and if a few pieces of metal, put together anyhow, and containing oil and a wick, are sufficient for our present needs, and are in correspondence with the other appliances used in the Army and Navy, then my labour, and your time in listening to me so indulgently, have alike been thrown away. My own conviction, however, is very strong that the costly engines of our great ironclads, or of our great Atlantic liners and other merchant steamers, require to be closely and carefully examined in a way which only good lighting can render possible; and that the crews of such vessels should be able to communicate intelligence or, if need were, to summon help, from over a far wider range than their

present lights will reach. The expense, I may be permitted to point out, is one of first cost only, and depends merely upon originally obtaining a properly constructed machine as the source of light. Light for light, perfect combustion is cheaper than imperfect, and these appliances do not render it imperative that those who have them should produce more light than they require. They give, without reflectors, a range of from five to twenty-five candles, according to the circumstances which may render any given degree of illumination desirable.

I would say one final word in behalf of our sailors, who, especially in some of the ironclads, live below in perpetual semi-darkness. I have seen, in these vessels, twelve men sitting around a table which was lighted, or rather the darkness of which was rendered visible, by the flame of a single rushlight, placed at one end of the space devoted to them. It was, perhaps, possible for one man of the twelve, if his sight were very good, to read or otherwise employ himself; but the rest were condemned to compulsory idleness. I cannot believe that such a state of things can be good either for the service, of which all Englishmen are so proud, or for the individual seamen who are placed in such a position; and I never felt more acutely the need there is for improved lighting on board ship than when I saw, at Portsmouth, the arrangement which I have attempted to describe, and with which many of those who hear me must be perfectly familiar.

I have mentioned that the lamps which I supplied to Her Majesty's ships were at first only lent to them for trial, and that after they had been in use nearly two years, the company by which they were manufactured received an order to supply more for other vessels of the Fleet. I have thought it would be agreeable to you to see to-night lamps which are in general use in the Navy, and which were the best that could be procured up to a recent date, and so I have obtained the loan of these from the Admiralty. I take this opportunity of publicly thanking their Lordships for thus lending them, and also of acknowledging, in the very warmest terms, the constant help and the ready courtesy and kindness which it has been my good fortune to receive from all naval authorities and officers, from the highest to the lowest. It only remains that I should thank you also for the flattering attention which you have been pleased to bestow upon my address.

Tabulated results of experiments made by W. Valentin, Esq., F.C.S., Principal Demonstrator of Practical Chemistry in the Royal College of Chemistry, London, for Mr. A. M. Silber's Lecture at the Royal United Service Institution, 4th March, 1878.

Engine-room and Passage Lamps.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
1. *Admiralty's Brass-back Lamp for engine-room (for lighting wing and screw-shaft passages) *with chimney*. Oil supply at back of burner.	18th February hours 3 min. 53	507 grains	(1) 8·0 candles (2) 2·7 „ Mean 5·35 „	94·8 grains	Burns very wastefully and irregularly.
2. Silber's Brass-back Lamp for same purposes as No. 1, *with chimney*. Oil supply at back of burner.	23rd February hours 2 min. 57	834 grains	(1) 16·0 candles (2) 15·2 „ Mean 15·6 „	53·5 grains	With reflector, 76 to 80 candles.
3. Silber's Engine-room Lamp, similar in shape to Nos. 1 and 2, but with handles. This lamp is *weatherproof*. Oil supply beneath the flame. *Without* glass *chimney*.	18th February hours 3 min. 42	1,005 grains	(1) 16·08 candles (2) 13·0 „ Mean 14·5 „	69·8 grains	Tested without reflector. Height of flame about 3 inches, 2 inches of which are full-bodied, shape good, colour white.

Saving—light for light—shown by Silber's lamps, about 35 per cent.

Engine-room Lamps.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
4. *Admiralty's Overhead Hanging Lamp in brass with clear bottom bowl; circular opening in centre of bottom, brass guard; oil container over burner and inside the lamp. *With* (shouldered) *chimney.*	23rd February hours 4 min. 20	480 grains	(1) 6·0 candles (2) 4·75 „ Mean 5·38 „	89·2 grains	
5. Silber's Overhead Hanging Lamp in brass with clear bottom bowl, *without opening* in bottom; oil container outside the lamp and above burner, which is inside lamp. *With chimney.*	23rd February hours 4 min. 20	884 grains	(1) 13·2 candles (2) 13·2 „ Mean 13·2 „	67 grains	Splendidly equal light. Glass shade cuts off one candle.
6. Silber's Overhead Hanging Lamp, similar in shape to No. 5, but having *two* clear bottom bowls, burning *without chimney.*	23rd February hours 2 min. 25	859·86 grains	(1) 16·0 candles (2) 14·2 „ Mean 15·1 „	56·95 grains	Flame short in height, but uniformly white.
7. Silber's Square Overhead Hanging Lamp, no glass bottom bowl; oil container below or under burner. One side opens as door, oil container easily removed by one hand; burns *without chimney.* Can be used with or without silver reflectors.	18th February hours 3 min. 47	1,040 grains	(1) 20·7 candles (2) 18·0 „ Mean 19·35 „	54 grains	Height of flame about 4 inches; shape good, colour white.

Saving—light for light—shown by Silber's lamps, 33⅓ per cent.

Gauge Lamps.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
8. Admiralty's Brass Lamp with 3 wicks. *Without chimney.*	23rd February. hours min. 4 25	248 grains	(1) 2·18 candles (2) 1·8 „ Mean 1·99 „	124 grains	Smoked tremendously. *With reflector.* (1) 3·25 (2) 2·40 Mean 2·8
9. Silber's Brass Lamp, similar to No. 8, but *with chimney.* Oil container beneath the burner.	23rd February. hours min. 4 25	594 grains	(1) 9·4 candles (2) 8·4 „ Mean 8·9 „	66·8 grains	*With reflector.* 31·5 to 37 candles.
10. Silber's Lamp, similar to No. 9, but *without chimney.*	23rd February. hours min. 4 25	646 grains	(1) 10·5 candles (2) 8·7 „ Mean 9·6 „	67·3 grains	*With reflector.* 30 candles.

Saving—light for light—shown by Silber's lamps, 46 per cent.

Mast-head, Bow, and Signal Lantern.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
11. *Admiralty Mast-head Lantern, with new reflectors and new glass lens.	9th February. hours min. 2 44	440·7 grains	*With Reflector and Lens.* (1) 12·4 candles (2) 5· „ Mean 8·7	50·6 grains	This lamp had 6 single string wicks only.
	18th February. hours min. 3 42	414 grains	*Without Reflector, but with Lens.* (1) 10 candles (2) 7 „ Mean 8·5	48·7 grains	With new reflector, this lamp gave only a slightly increased light, viz., 16 candles. The wicks were found in fair condition.
12. Silber's Mast-head Lantern (ready to be sent out) with reflector and lens. Argand burner without chimney.	18th February. hours min. 3 0	1,005 grains	*With Reflector and Lens.* 50 candles *Without Reflector, but with Lens.* 40 candles.	20·10 grains 25·12 grains	

Saving—light for light—shown by Silber's lamps, 54·43 per cent.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
13. Captain Colomb's Patent Signal Lamp (new Lamp, bright reflector) made by Nunn.	9th February hours min. 3 35	279 grains	*With Reflector and Lens.* (1) 11·8 candles (2) 2·2 „ Mean 7 „	43 grains	The lamp had 7 single string wicks which burnt well at first, but after 4 hours burning were all but destroyed, 2 were quite extinguished, the heads of 2 fused into one, and one was burning very low.
14. Silber's Mast-head Signal Lamp with French dioptric lens, Argand burner, without chimney.	9th February hours min. 4 5	724 grains	*With Lens.* 30 candles	24·13 grains	
15. Silber's Starboard Lantern.					
16. Silber's Port Lantern.					

Saving—light for light—shown by Silber's lamps, about 40 per cent.

NOTE.—Silber's Mast-head and Bow Lanterns are constructed to burn the same size wick (diameter $1\frac{1}{13}$ in.) as in his Engine-room Lamp No. 3, and as the conditions of burning are almost the same, it may fairly be assumed that the light given by the former without lens, is the same as that of the latter, viz., 14·5 candles, and the consumption per candle-light 69·8 grains per hour.

Silber's Moderator Lamps for Ship's use.

	Diameter of Wick.	Candle-light.	Average Consumption per hour per candle power.
No. 1 burner	1 inch	25·9 candles ..	49·0 grains.
No. 2 „	$1\frac{5}{24}$ „	32·5 „ ..	
No. 3 „	$1\frac{1}{2}$ „	42·5 „ ..	
		Ordinary moderator..	65 to 66 grains.

Petroleum Lamps.—Tested to Ascertain Temperature of Oil after ten hours burning.

Name of Lamp. Lamps marked thus * were lent by the Admiralty.	Time over which the experiment extended, and date.	Hourly Consumption of Oil (Colza).	Illuminating power: (1) At beginning of experiment. (2) Towards the end.	Quantity of Oil consumed per candle power.	Remarks.
Petroleum ship's lights. Silber's Flat wick Mast-head light (without glass chimney).	..	..	*With Reflector* 43 candles *Without Reflector* 7 candles	..	Tested chiefly for *temperature* of Petroleum in oil container. Temperature of atmosphere, 50° F. Temperature of Petroleum after burning in open air for some hours, 68° F.
Silber's Anchor Light (1877) burner with glass chimney.	..	not	tested	..	Temperature of Petroleum in oil container, 53° F.
Silber's Mast-head Lantern (1877) burner with glass chimney.	..	not	tested	..	Little oil left in oil container —Temperature 73·4 F. The oil container was quite cold.

(Signed) WM. VALENTIN,

Principal Demonstrator of Practical Chemistry in The Royal College of Chemistry. South Kensington Museum.

February 27th, 1878.

Admiral Lord CLARENCE PAGET: I am not going to occupy your time this evening. You have more able and scientific men than myself present, who will probably give their views on this matter. All I can say is, I have for several years used these lights, and I have found every word the lecturer has stated, perfectly true, and that they are impervious to the sea-water breaking over them. Whenever in the length of the summer nights I have had occasion to use them, they have never wanted trimming, and certainly we have been distinguished from all other yachts in a large fleet. I remember only last summer being at Cowes with a fleet of upwards of a hundred yachts. Mine was a small yacht, and of course had a small light. They did not know where my yacht lay, but in the Club House I asked the members to look at the fleet and say which was the brightest light in the roads, and they one and all gave it altogether in favour of my yacht, which carried Mr. Silber's light.

Captain STEWART HARRISON, London Engineer Volunteers: I would ask permission to say a few words on this very important topic. Mr. Silber has provided us with a number of most excellent instruments, but I fail to see the players. The question of signalling at this moment, as he states, is one of the gravest importance in both services. The rapidity of motion in steam-vessels, and the almost certain death that attends mounted Officers in many positions, will render signalling in the Army and Navy a question of the very greatest importance if any of those things which we are now all thinking about, should happen. Hence, if I may for a few moments take this question out of the region of the lamp-maker and the mechanic, and take it to the region of the philosophy of signalling, I would venture to say, speaking as I am to men who have endeavoured as conscientiously to acquire the art of signalling as they have attempted to acquire a knowledge of their other duties, that they will confess that the acquisition of signalling by the Morse system is one of those things that have baffled them. I do not think that any man over forty could possibly acquire precision in working the Morse system of signals; and that there is some radical defect in the present system of signalling will be manifest from what I am about to state, that in the whole of the Mercantile Marine there is no recognised communication between vessels at night. A vessel at anchor will see another coming bows onward that will crush her to pieces, and yet she has not a single means by which she can make known the fact that something prevents her getting out of the way. Granted there is a rule of the road; granted there are a number of circumstances which may justify its continuance; it is a most remarkable thing that in a country of practical men like Englishmen you have no recognised communication amongst the Mercantile Marine, whose interest it is to have this mode of communication, if it existed. I believe we took to the Morse system by a mistake, and we threw on mind what we ought to have thrown on mechanism. I think, with reference to the Morse system, that the extraordinary simplicity of the flash has deluded men into the belief that they could all learn it. I am speaking now in the presence of naval and military Officers, and I will ask any military Officer now present how many of the men whom they sat down to meet with to-night could be trusted by the Morse system to signal an order to the regiment to which they belonged? I do not believe 5 per cent. of your Officers could be so trusted, and of your men I do not believe 2½ per cent. could be. If I go to the Navy, I believe we shall find that only 10 per cent. of the Officers are capable of conveying a message, and I certainly believe nothing like 10 per cent. of the men could do it. Under these circumstances it does become an absolute necessity for an Institution like this to make inquiry whether this system, which has been in existence so long, which has so conspicuously failed to penetrate where you would be most likely to expect it to penetrate—whether it has the merits that have been claimed for it. I am not at liberty, I believe, to-night to introduce a remedy for these things, but I will simply say this is what I am prepared to do. I will go on board any of Her Majesty's ships, and with the assistance of the carpenter and the lamp-maker and Mr. Silber—and Mr. Silber will be my most able assistant—I will in two days furnish you with a means of communication at five miles from one vessel to another, and in a week every man on board that ship who can read and write shall be competent to exchange signals with any vessels at that distance. I will go down to Aldershot, will take a class of Officers, and in one day those men shall be able at two miles to drill a battalion as easily as if they stood in

front. I make these statements, and I simply ask an opportunity of proving what I say before the members of this Institution.[1]

Major-General BABBAGE: I think we must all agree in praising the light exhibited by Mr. Silber, but in what I have to say I wish rather to follow the last speaker in the matter of signalling. My father, the late Charles Babbage, in the year 1851, publicly exhibited his occulting light.[2] It is so arranged that any seaman could count the number of the flashes, "one, two, three," &c., as Mr. Silber has shown us in one of his own lamps. It seems to me that this is a thing which is not beyond the intellect of the commonest seaman or soldier, and, as the last speaker has said, with Mr. Silber's aid I believe signalling may be made easy both in the Navy and in the Army.

Professor BARFF: I shall be very happy to make a few remarks on some experiments that Mr. Silber has alluded to which I have initiated from my own point of view, a point of view which will be of interest to those engaged in Army and Navy matters in cases where colours have the property of being clearly distinguished in signalling. Three years ago, in my lectures at the Royal Academy, I introduced Mr. Silber's light to the students, because I found it to be that which gave the purest white light of any artificial light I knew of. This was done, I will not say entirely without the knowledge of Mr. Silber, because I had put the light in my own room where I keep pictures, and had found it to be so successful that I asked him to lend me some lights to illustrate my experiments at the Royal Academy, and there I showed some papers before the students tinted with the palest possible yellow and green. Very delicate tints of yellows and green cannot be distinguished from whites and blues by the ordinary Argand burner, but as soon as Mr. Silber's light was used, the students were able at a distance of this lecture theatre to distinguish the colours one from the other. Only last week, in conjunction with Mr. Brudenell Carter, a scientific oculist of great eminence, I performed some experiments to judge of the character of the Silber method of burning oil, gas, and petroleum, he looking at it from the oculist's point of view, and I from the artist's point of view, although I am not an artist but a chemist. We found that in the case of the Silber light, we had nearly the proportions of the solar spectrum, or the electric spectrum, which answered our purpose perfectly well. With the ordinary Argand we had not those proportions, because the violet rays were utterly absent in the spectrum from the Argand, and only a very little of the indigo was seen, whereas by the Silber the petroleum and the gas being the only two we tried, we found we had both the indigo nearly perfect and violet rays as well. I wish to mention this, as it is a matter of considerable importance, for white light is the most wholesome for the eyes; it is the best where colours have to be dealt with, and has the greatest possible penetrating power in darkness. I will not detain you longer, but at some future time (and these experiments will take some time) I hope I shall be able to publish the results, and if an opportunity is given to me I shall be most happy to state those results before this Institution.

Mr. LANGLEY: I am not a naval nor yet a military man, but perhaps I may be able to say something about these lamps as used on railways.

I recommended the use of Mr. Silber's lamp to the Great Eastern Railway; they adopted my suggestion, and we have now over a thousand of those lamps in use, and have never had any instance of failure either through the lamps going out or the chimney blackening. The economy of the lamp is very great over the old rape oil lamp, and altogether it has proved very satisfactory. There is one point which is very important, that is, that the light always remains the same as when it is first lit, and it continues burning the same light for as many hours as required. The difficulty with lamps has always been to supply sufficient air, and still not blow the light out. A great number of experiments have been made in order to attain a satisfactory lamp, but they all failed until Mr. Silber's arrangement was introduced. In

[1] Captain Stewart Harrison would be glad to communicate with any owner of a yacht, or other person taking an interest in the question. He estimates the cost of a pair of signal screens, nine feet by three feet, sufficient for a yacht, and visible at from two to three miles, at about £6 10*s*. Any carpenter can make them, and the lights are simply the police bull's-eye lanterns. His address is with the Secretary.

[2] It is described in "The Exposition of 1851," by C. Babbage.

regard to the question of burning rape oil I may state that Mr. Silber's lamp burning petroleum with a proper lantern is as safe as the rape oil. Many lamps have been used where proper ventilation has not been given, and the result has been the petroleum has got so hot that there has been an explosion, or it has blackened the chimney, but with Mr. Silber's arrangement the oil in the cistern is kept 10 or 20 degrees cooler than the flashing point, and it has always been a perfect success.

Mr. Frederick PATTISON: I have had much pleasure in listening to what Mr. Silber has said, but there are one or two points on which I should like to ask him questions. Of course in the Navy, as well as in domestic and other lighting, economy is a great thing to be considered. Mr. Silber has given us no particulars, as far as I can make out, as to the consumption and cost of oil for light given. I should have liked to have heard something on that subject, because it is one that is very important. We have wandered somewhat from our subject to that of signalling, but may I ask in what respect the new flashing signal differs from that which has been in use in the Navy for many years? I admit that Mr. Silber has shown us a superior light, but still the old flashing signal, as far as I know, was quite capable of being brought to the same power as the one we have now dealt with. I should also like to know whether it is usual for mast-head lights to be used as signal lights. I think not. Then, as far as railway lights are concerned, in what respect does the light we have had described to us show an improvement upon many lights at present in use? With respect to the lighting Her Majesty's ships Mr. Silber spoke of a "dip" being used to give light to the mess tables. I would ask whether he has been lately on board Her Majesty's ironclads so as to be enabled to speak on that subject more fully than he has done, because, as far as my experience goes, the lighting of the ironclads at the present time is far superior to that described by the lecturer.

Captain COLOMB, R.N.: I think Mr. Silber is to be very warmly congratulated on taking the lamp question out of the area of those "pieces of tin and bits of glass" which he spoke of, and putting it on to some definite and scientific basis. I am quite certain that every movement which is made towards the improvement of light, whether it be for the time successful or not, is perfectly certain to leave its mark; and I think myself that next to heating there are very few questions more important than lighting. To plunge at once into some of the details, I am quite certain that the meeting will excuse me from attempting to follow the whole of them, for they have been piled upon our heads something like Pelion upon Ossa. It has been extremely difficult to follow the lecturer through the statement of his principles, and the methods by which he carries them into practice. But I notice one thing in the whole of his lamps, and this is distinctly a point that we should carry away with us, and, remember, every lamp he has produced is a rival to some bygone fellow, *and is larger*. Now, the moment you increase the size of a lamp, you approach more nearly to the ideal which the lecturer put before us. The moment you enclose your light in a larger framework, or lantern, you get rid at once of half your troubles; because, as the lecturer distinctly pointed out, the currents of air are dissipated before they reach the flame, and therefore do not disturb it. Now, I am sorry that when he prepared this paper, and brought the question before us, he did not recognise the necessity of confining himself to present sizes, because the size of lamps is an exceedingly important element in their use on board ship. Those bow and mast-head lights that you see are of course considerably larger than those others beside them. But while I say this—and I am bound to give an honest criticism—I do believe that the method of supplying air to the lamp is new, and so far as I can judge from the very hasty notion I have formed upon it, the idea is not like most of the new ideas, it is true. Mr. Silber seems to have done this. You have two difficulties to contend with in supplying air to lamps which are exposed to the weather, the force of pressure and the blow due to currents of air. Now by admitting the air into his air-chamber, and allowing the superfluous air to escape at the top of the lantern while only that which is actually required by the flame itself passes below, he seems to have guarded against both those dangers; he seems to have got rid of the pressure by opening the place for the air to escape at the top of the lamp, and to have got rid of the current by the old arrangement of what is called the brake—something for the air to throw itself against and radiate from. I would not put too much faith in Mr. Silber's trial by bellows; it is exceedingly deceptive. Many a

lantern which you may blow against with all the bellows ever constructed in a room, will not stand a very moderate breeze of wind. That is a practical result which I achieved after very many experiments. I found I was obliged to give up the bellows trial altogether, and I had always to wait for a gale of wind, and try my lanterns in that gale of wind. I found that was the only trial worth anything. I do not think that the reduction of oil consumption is of very great moment, at any rate to Her Majesty's ships. But we must never forget this, that Mr. Silber gains his increased light not altogether by gaining upon the consumption of oil, but he must, I think, in all cases, for a given size of wick, increase the consumption of oil; but then given that increase, he will get more light out of it than could be got by other processes. So that there is an economy really, if you propose to burn more oil; but if you are limited in the quantity of oil you burn, then of course there is not an economy, that is to say, you *must* burn more oil.

Now the difficulty in the whole question is the difficulty of complication. Mr. Silber, and many of us here, would be perfectly competent to manage any of these lights, but my difficulty has always been to fit the lights to the men who had to use them. I cannot alter the men; I have never been able to do so. I have tried over and over again to alter the men, but I find the one thing which will not alter is mankind; and whenever I have attempted to bring material to the use of mankind I have found that I have had to suit the material to the man, because I was unable to suit the man to the material. If I am wrong in supposing that the complication of these lamps is considerably greater than that at present attaching to lamps in use —in the Navy for instance—of course my argument falls to the ground. But that is a matter which can only be tested by practical experiment, and I wish Mr Silber had been able to produce to us the reports of his lanterns as used by Her Majesty's Government. I know it is very difficult to get those reports. There is an objection in official quarters to furnish reports—a very mistaken one in my opinion—and it is very difficult for outsiders to get at the results. But whether the lamps be complicated or not complicated, cannot be expressed offhand here in this Institution. It is a matter which must be put to a practical test, and that will decide. I am pleased to see Mr. Silber is turning his attention to flashing signals. I shall be very glad if he can induce Her Majesty's Government to get a better kind of lamp. I have tried myself, but the Treasury always seems to stand in the way of those little matters. It is a pity that while Mr. Silber introduced what he supposes is a better flashing arrangement he did not give it to us in a complete form. He has introduced one of the many methods of using the eclipser, but he does not show us how he is to arrange it, considering that the lamp must hang upon gimbals perpendicularly, unconnected with the ship at all, except through the point of suspension. I do not mean to say that it is impossible to do it, but there it is. I have never heard, so far as I know, any complaint made of the simple eclipser which we now use—I do not at all mean to say that I will not back a better shade when I see it—I certainly will. The hand-signalling lantern which Mr. Silber showed us is not new in principle. I am glad to see Mr. Babbage's son here to-night, because I can bear testimony to the fact that the lamp now in use in the Army is practically Babbage's lamp. That thumb arrangement which Mr. Silber has shown us, which I have no doubt is borrowed from the present Army pattern lamp, that was Mr. Babbage's own arrangement, and a very good one it is. The lamp before us is simply a larger description of the present Army signalling-lamp—nothing more.

I should like to correct the gentleman who spoke about the Morse code. In the Navy the Morse code is not used; in the Army it is used. In the Navy a much more simple code of flashes is employed. I may express my own conviction that the time is close at hand when the Morse code will supersede the present simple system, which is my own introduction in the Navy. I say this after considerable thought. I know I am in the minority, but I think the time is close at hand when we shall see the Morse alphabet very largely used. I do not think it is quite so difficult, judging from all that I have seen, as the gentleman who spoke, made out. Possibly it may be for men over forty, but I do not think that it is necessary for men over forty to undertake it. The process of trimming of course is most important. The lecturer very properly pointed out the accidents which do occur from side-lamps—red and green bow-lamps—being removed for trimming just on the

approach of another ship; so that the other ship does not see the position of the ship approaching her, which is having its lanterns trimmed. I long ago came to a conclusion on that head, and I have not seen or heard anything to-night to alter it. I came to a distinct view that as you can get out of a candle the necessary power for the bow and mast-head lights, I prefer the simplicity of the candle to any arrangement of oil lamp, to Mr. Silber's, or any other arrangement that I have ever seen. You put your candle in the first thing at night, and take it out the last thing in the morning; there is no trimming in the case at all. I quite agree in the condemnation given to petroleum; I think it is most dangerous, and the assumed cheapness of it is not for one moment to be set against its danger. Mr. Silber spoke hoping that his labours might be of value. I am quite certain that they are of the very greatest value, and I hope that the lecturer will not imagine that in the criticisms I have felt it my duty to make I am at all disparaging what I know from personal experience must have been very intense labour, and have required very great perseverance. I have had some little experience myself in that matter, and I do not know anything more wearying to deal with than the flame of a lamp.

I quite agree as to the necessity of improving the arrangements for signalling. I think at night, even in the Navy, our arrangements are still defective. We have not any recognised system of signalling by night in the mercantile marine, and if the gentleman who spoke will produce his system, and if it will do what he says, all I can say is I will back him to the very fullest extent of my power. I think at this time of day it is a disgrace to us that while all the navies in Europe without exception, even the navies of Greece and Japan, have adopted a system of night signalling, that the great mercantile marine of England should be absolutely without one single means of communicating at night. If Mr. Silber can force that question into prominence, supposing the whole of the rest of his arrangements fail, he will have done very good work. I am not speaking of any particular system. If a system can be got which is available for the mercantile marine I hope we shall get it. There is one point relating to side lights which we should recollect. I do not think it is a good thing to have too great a range for the mast-head and bow lights, I think the range which is set down in the Board of Trade regulations is a very suitable and proper range. To have your lights so powerful that they can affect the movements of a ship five or six miles off I take to be rather a dangerous thing. The order is that the lights are to be visible, the bow-lights at two miles and the mast-head at five miles. The mast-head, of course, is nothing. The bow lights are the things by which you must act on seeing the ship; the masthead light does not give you any clue. I think it is very undesirable indeed that ships should act too soon, and I think the present range—lights showing clear for two miles at night is a sufficient range; and it is a pity to try to go beyond that. It is more important that the lights of all ships should be uniform; that is to say, that when you see a light it should give you some idea of its distance. If you have on board one ship very bright lights, and on board another very dim lights, you are always puzzled, when you come to act, as to the distance which the ship is off. I think it is much more important to get a uniform small light, so to speak, than to have some ships with very large ones, and others with very small ones. I was sorry to hear Mr. Silber speak so disparagingly of the light supplied to our seamen. I agree with one speaker who said that he did not think Mr. Silber had recently visited some of Her Majesty's ships. It is a point that struck me some years ago very strongly, and I hope in the course of time we shall see a better arrangement general. We have, so far as we know, got a system of lighting which will give more light and still save £12,000 a-year to the Government, which I hope may enable us to supersede the "rushlight" by, perhaps, one of Mr. Silber's lamps.

Mr. LANGLEY: I spoke about the temperature of the oil being 10 or 20 degrees below the flashing point. The flashing point of petroleum is 100 degrees, and the temperature of the oil in the cistern is kept at 90 degrees and under.

May I ask one question? Captain Colomb spoke about petroleum, and the dangers attendant upon its use. He did not mention that there is belmontine, which will not flash at any point whatever, and is perfectly safe; you could put a match into it. I should like to ask Mr. Silber, whether his lamps would burn that oil?

Commander GILMORE, R.N.: I must join issue with Captain Colomb as to two remarks which he made, one the necessity of having a uniform light, and the other at a distance of two miles. With reference to the last point, at the present rates of speed at which our ships travel, two miles are very soon passed over, and I think, therefore, it would be advantageous for the lights to be visible at a greater distance than two miles. With reference to having the lights of an uniform power, I think it would be preferable to have a uniform light of great brightness rather than a uniformity of dimness.

Captain CROZIER, R.N.: It has been remarked by a gentleman that he did not believe there were 10 per cent. of the Officers and men in the Royal Navy who understood the Morse system. I do not believe that there are 5 per cent. of the Officers who do not understand it. I have been in many parts of the world, and I speak as I find it. I do not think that there are 5 per cent. of Officers in the British Navy who are unacquainted with the flashing light.

Mr. ARTHUR DIOSY, R.N.A.V.: Mr. Silber alluded to the necessity of the frequent retrimming of his lamps being obviated. Of course I stand at a great disadvantage in speaking so soon after Captain Colomb, who is perhaps the very highest authority on this question, but still I think I can back him up most emphatically. I dare say several gentlemen present have been in charge of ships when their safety depended on keeping the usual bright look-out and the lamps clear. For myself, I have had the honour of being lamp trimmer of a watch, though rather in an amateur capacity, on board of one of Her Majesty's ships, and I am sure that the amount of suffering and anxiety I had to go through with those miserable lights of the old service pattern was something tremendous. That is why I should be much obliged to Mr. Silber if he would explain by means of what apparatus he obviates the necessity of losing a large amount of time in having to meddle with the wick of the lamp, and occasionally spilling the oil and giving rise to those dangers which the lecturer has described. I am sure everyone who has had any experience of bow-lights will endorse this opinion, and if Mr. Silber's apparatus for filling a lamp without removing it from its place is a practical one, it has broken down one of the great difficulties which have been encountered in trimming the lights of a ship.

Mr. SILBER in reply said: The first question asked me was, as to the saving effected by the use of my lights. I avoided going into that question as much as possible, but light for light, as shown by the comparative results of tests made by William Valentin, Esq.,[1] engine-room and passage lamps effect a saving, light for light, of about 35 per cent.; in engine-room lamps, 32½ per cent.; gauge lamps, 46 per cent.; mast-head, bow, and single lanterns, 54 per cent., and in other various lamps a saving of 40 per cent.

With reference to the possibility of producing a larger light upon the system at present existing I must distinctly differ from what has been said. And I do so for this reason, that at a competition of the Society of Arts a medal was offered for the best lamp which could be produced for burning vegetable oil without the aid of a chimney, and the result showed that no competitor could produce a light equal to four candles. I think that is very good evidence that they could not produce it, and I will tell you the real reason. Every flat or circular flame hitherto supplied in a lantern had to obtain its oxygen to its outer and its inner mantle from the oxygen that was contained in the lantern itself; and for that very reason, whilst the process of combustion was going on, half consumed carbon was carried away, and so produced what was generally known by the name of smoke. Now the process which I have adopted is this, that the formation, or the admixture of the gases which produce the flame—the oxygen, hydrogen, and carbon—is completely effected before the flame issues from the cone. The whole lamp itself is practically sealed, so that there is no oxygen within the lantern, or only an inappreciable quantity, and if the experiment were tried it would be found that no flame of a similar size, that is to say, of such a practical size as that in my lamps, could be produced by the methods that are at the present moment in use all over the world.

About the signal lights and about the trimming I can only reply in this way. The

[1] Fellow of Chemical Society, Principal Demonstrator of Practical Chemistry in the Royal College of Chemistry, London.

lamps supplied to the Admiralty were guaranteed to act for eighteen consecutive hours, and to be watertight; that is to say, even if they played with a hose, of two or three inches diameter, upon the lamp the whole day they would not force a drop of water into the flame. I have not seen the reports made upon the lamps, but the Admiralty has ordered a much larger quantity of them, and has paid for those previously had. I think that is sufficient evidence that they are satisfied.

I feel very much gratified at Captain Colomb's remarks. Criticism on the part of Captain Colomb I look upon as a compliment, for I do not think there is another gentleman who has studied the question of lights for ships so much as he has. But I believe he is to some extent under an erroneous impression in saying that all my lamps must have an increased size. To some extent he is right, because the larger the flame the greater must be the circumference of the lamp. Of course in a room where one person could live comfortably, fifty people could not breathe. Some of my lamps, therefore, are larger in proportion according to the light. Now, as to the trimming, the question is this: to fit the lamps to the men, as Captain Colomb has rightly expressed it, therefore I have provided a wick of a certain size cut by machinery, perfectly level and perfectly smooth; and there is this fact, that if the wicks have a quarter of an inch cut out of four different places, the combustion with the wick so deranged is equal to what it would have been if the wicks were perfect. It would make no difference whatever.

Captain Colomb also alluded to a distance of five miles; that is the regulation distance for mast-head lights. I consulted Professor Tyndall on the subject, and he said, "I am perfectly satisfied with what you have done; continue in the same direc-"tion." I have also heard an objection raised, which has not been raised this evening, that it might be mistaken for a lighthouse; but Professor Tyndall said he was not at all frightened at that, and besides, with the arrangements they are making at the present moment for lighthouses, the lighthouse can be very easily distinguished from a ship.

The peculiar green of the lens of this starboard lamp is a very important matter. These lamps were tried at a competition at Shoeburyness, and I have a certificate in my hand which states—"One point, visible, bright; two, visible, bright; three, not "quite so distinct; four, ditto; five, clearly visible; six, ditto; seven, bright; "eight, ditto;" one point above being not so distinct, and two points ditto. "As to "that showing more ahead than ten points, no." Of course that is satisfactory, so that this passed Shoeburyness as being a perfect lamp.

I was asked whether I had recently seen the lighting in ships. I asked permission of the Admiralty, and went recently on board H.M.S. "Thunderer," and also on the "Minotaur;" and, as I stated in my paper, I found that a dip light, certainly not thicker than my little finger, was fixed against the wall with a small piece of tin, and twelve men were sitting round the table, of whom eleven could not do anything, and the twelfth man was attempting to mend some article of clothing.

On the question of suspension I may say that the lamp balances itself; it is carefully calculated as to that.

Captain COLOMB: I meant you must connect your flashing arrangement through your point of suspension.

Mr. SILBER: That is a question of very great importance. I intended to do it by a bell-crank arrangement, to be so adjusted for on signalling with the aid of cords as to make its action as simple as that of Captain Colomb's. I am not satisfied with the results in my own mind. It seems to me, at present, that the disadvantages so counterbalance the advantages that perhaps it may be quite as well let alone.

Captain COLOMB: You cannot use your lamp for flashing purposes unless you have that, because the slightest motion of the lamp will cause the shades to open.[1]

[1] Mr. Silber did not understand Captain Colomb to have made this last remark, or he would have replied that on the contrary no violent motion, no vibration of any kind, not even that produced by the discharge of guns on board, would cause the shutters to open, as they are locked by a rack and pinion as well as a screw bolt.

On the last occasion of Mr. Silber's visit to H.M.S. "Minotaur," Lieutenant Campbell, R.N., kindly showed him all the positions in which signal lamps used, and Mr. Silber has provided for his signal lamp being used in all similar positions.

The CHAIRMAN: I think we may now bring our proceedings to a close. Before doing so I wish to make one remark upon an observation that fell from Captain Colomb. He alluded to what he called the complications of Mr. Silber's lamps being too great for the men who would have to use them. Now I think, considering the state of complication of all our new ships, filled as they are with machines of all sorts, the great guns, as we heard here the other afternoon, worked by very complicated machinery, I think if the men are intelligent enough to be brought up to use all these machines, we need not despair of Mr. Silber's simple arrangements being used with intelligence. And I think my friend, Captain Colomb, rather contradicted himself, for in arguing with regard to the Morse signals he said there was no difficulty whatever. Now, I think, if a man can master the Morse signals he may very easily master the arrangement of Mr. Silber's lamps. I am sure we are all highly indebted to Mr. Silber for what he has brought before us. I certainly had no idea that there was so much to learn and so much to see with regard to these lights. The old "dip"—Mr. Silber called it a "rushlight"—is an old light we knew very well at sea. When I was on service formerly, I always felt that the way the lower and orlop decks and the interior of our ships were lighted was a perfect disgrace—it was quite lamentable to go down below in those ships and see the miserable horn lanterns we had to carry about, and the indifferent lighting where the men lived. I believe it is better now; at any rate, if not, it ought to be. I maintain that every ship ought to be as light below during the night as if it were daylight. With these observations I am sure I am only doing my duty, as Chairman, in conveying to Mr. Silber our heartfelt thanks for the paper he has read to us.

Evening Meeting.

Monday, April 15th, 1878.

ADMIRAL SIR FREDERICK W. E. NICOLSON, BART., C.B., Vice-President, in the Chair.

STEAM-POWER *VERSUS* SAIL-POWER FOR MEN-OF-WAR.

By Captain P. H. COLOMB, R.N.

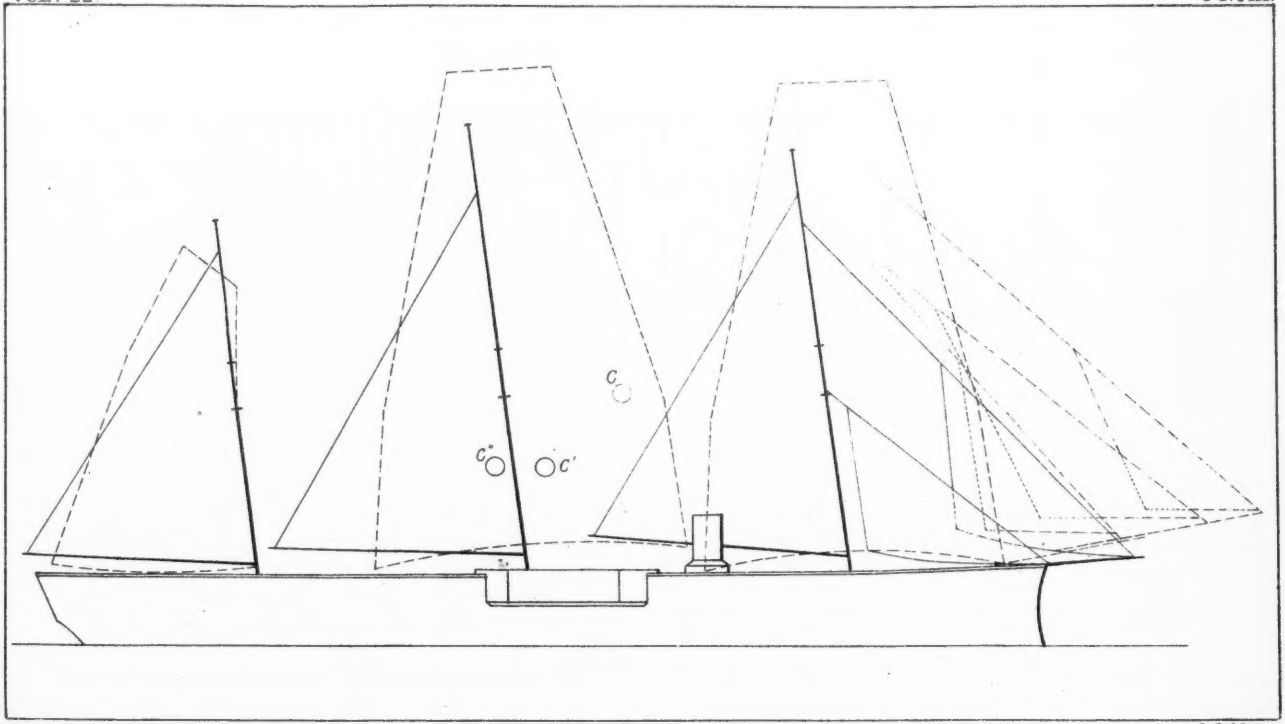
1. IN my Essay on the "Development of our Maritime Power," I have rested the propulsive force of our war ships almost entirely on their coal stowage, and on the means at disposal for their replenishment with coal in our own depôts. I have proposed that the sail-power of our war ships should be reduced to the position of a true auxiliary. We should, I have assumed, build our war ships without any reference whatever to sail-power; and after the design is completed, we should then furnish them with such a rig as should give them the least possible inconvenience in foul winds, and the greatest possible assistance in fair winds.

2. So bold a proposal requires some facts and arguments to back it, and I am here to-night to offer both for discussion.

3. Though a considerable change has passed over our minds within the last ten years in the view we have taken of the relative position of steam and sail power in a war ship, I am not without apprehensions of being considered rather too advanced in my present views. But I trust that those of my brother Officers who start at what may seem at first revolutionary theories, will understand that I do not advocate any sweeping changes without due experiment; and that I do not think we can advance at all, unless we do so on certain ground.

4. On the other hand, I have reason to believe that I should now carry with me a considerable body of steadily-formed opinions, were I to confine my views of the decadence of sail-power to the ironclad—or as I hope she may in future be called, to the Fleet Ship. I have been a little surprised to find what an alteration naval opinion has undergone in this matter even since I left England in 1874. These things make me hopeful that, though I may be too advanced at this moment, I shall be perhaps behind the age in five years' time.

5. But, in any case, whether I be too advanced, or altogether mistaken, in the views I put forward, there is great value in advancing them. I do not know any method of examining the soundness of old views better than testing their strength by the advancement of new ones. And, while I would always deprecate the ventilation of ideas which are simply wild, and rest on no definite data, I am a great advocate for the publication of all views which have such a foundation,



J. Jobbins

even though the conclusions drawn may turn out to be wrong. I have, in short, a great faith in the accumulation of FACTS as a basis for argument, and believe that such accumulation is never made in vain.

6. The method I have adopted in this accumulation of facts may, I think, be relied on so far as it goes. It has involved some patient labour, but promises the advantage of being truly inductive, so that the facts established form a perfectly solid basis, whether the conclusions to which I think they point may or may not be approved.

7. Serving recently in an ironclad, I very early became impressed with the smallness of the results due to the employment of her square sails, but I was not at first prepared for the insignificant appearance their propulsive power would exhibit when investigated and compared with that of the engines; and most certainly I was not prepared to accept my present conclusions, which I may state were adopted by Captain Fisher as far back as 1871.

He then wrote:—"*Masts and sails should be done away with.* The "weight and room they now represent should be taken by coal. No "better proof exists of the wisdom (the economy and efficiency) of "doing this, than pointing to the example of all the new ocean steamers, "amongst the most successful of which are Mr. Holt's. These steamers, "built more for cargo than speed, make the passage from Liverpool to "Singapore in 45 days, and they carry 90 days' coal. A paper might "be written to prove the actual waste of coal caused by masts and "sails in squadron sailing, due to the frequent stoppages and altera-"tions in speed; and it may almost be asserted, as a general rule, "that the cost of refitting exceeds the value of the coals, which would "have been used in the year's cruize had steam alone been used."

8. I have, in fact, made a long series of the calculations imagined by Captain Fisher, and the results are, to my mind, nothing less than startling in their confirmation of his views.

9. But, for investigations of this sort, the experience of the Channel and Detached Squadrons must generally prove exceedingly misleading, for their proceedings and movements are usually governed by their interior convenience, and not by the pressure of circumstances outside them. The test which is required to finally establish the proportions of sail and steam power proper to a modern fighting ship, is that of war; but very often the ordinary service of a foreign station so closely resembles a state of war, that useful conclusions may be arrived at, even in peace time. When the movements of a ship are governed by circumstances outside herself; when she must be at certain places at certain times without any reference to her interior convenience; the real value of her propulsive powers becomes apparent, and she establishes facts relating thereto, which, if carefully investigated and recorded, become an excellent and reliable guide for the future. A Fleet Ship on a distant station, with a good deal of sea work, and almost always impelled from point to point by considerations which, if less imperious than those developed by war, still in some degree represent its demands, appears calculated to furnish some of the most useful experimental data available in peace time.

10. In order to get at some definite results, I determined to investigate very closely the value of the sail-power of such a ship during a period long enough to make a fair average. I selected two complete years, ending on the 28th October, 1876.

11. The questions to which I have endeavoured, by an appeal to the actual facts, to get answers, are the following:—

(*a.*) The hull, engines, and boilers of the ship being considered fixed quantities, the variable elements of her propulsive power are the coal supply and the masts and sails. The masts, yards, and sails, actually in use, represent a certain weight, and they also induce further weight in the shape of stores; and in the ship in question, a very large additional weight in the form of ballast. Do the sails in their propulsive power represent the equivalent of the weight they involve?

(*b.*) If it appears that they represent a power in excess of this weight in the form of increased speed, or decreased coal consumption, then it is clear that sail-power is properly arranged. But if it is found that even in peace time, and in ordinary service, the propulsion extracted from sail-power does not reach the equivalent of its weight, it would appear that a re-distribution is required.

(*c.*) If the sails upon the whole make a loss, instead of a gain, in propulsion, should we not look to their inconvenience to a fighting ship in time of action, and also to the increased draught of water of the ship?

(*d.*) Taking the lowest view of the question, that of simple saving of money, and supposing still that sail-power as arranged shows a loss stated, say in tons of coal, will not the debit side of the account be very much increased by the cost of wear and tear, and by the interest on capital sunk in the rig?

(*e.*) If we decided that in any particular ship the existing rig showed a loss, is there any modification of that rig which would give us the maximum of assistance when the wind was fair, with a minimum of retardation when it was foul?

12. It was some time before I succeeded in establishing satisfactory rules for calculating the value of sail-power, but I think those which I finally adopted may be applied to any ship with confidence. The rules are simple, and the process of calculation, though laborious and troublesome, is not difficult, and does not involve any abstruse problems.

13. Table I is one of forty-five which were completed for the purposes of this paper, and its construction may be now described.

(*a.*) The distances through the water as logged hourly are taken out and totalled, the totals being placed in the columns for distances under steam alone, steam and sail, and sail alone, opposite the number of hours occupied in passing over each distance.

(*b.*) The coal burnt while actually steaming is placed opposite each distance run under steam alone, and under steam and sail.

(*c.*) The coal expended in banking fires and waiting orders is omitted from this column, so that when the ship is under sail alone this column is blank opposite that distance.

(*d.*) The coal saved or lost, and the miles gained or lost by the use of square sails, are calculated in this manner. The best data which

can be had under steam alone are selected, care being taken that the time and circumstances correspond as nearly as possible with those under square sails, in order that the estimated loss or gain may be accurate; and doubts are generally given in favour of the square sails. The coal saved by the stoppage of the engines, when under sail alone, is debited with any charge against the saving which may exist on account of banked fires, waiting orders, &c. The saving or loss thus obtained is placed in the proper column with the plus or minus sign. The miles gained or lost are obtained from the same data, and are placed in the proper column with the plus or minus sign. Thus, for example, taken from the table:—The ship on the 4th June, 1875, was under sail alone for ten hours, making 37·6 miles through the water in that time. The fires being banked, ·75 tons of coal were expended. Now, from a mean of the ship's performance under steam alone, under similar conditions of wind and weather on the 6th and 7th of June, it was found that she went 6 knots at 5·3 miles to the ton of coal. On the assumption that she would, had not square sails been set, have gone for ten hours at the rate of 6 knots, and an expenditure of 1·12 tons per hour, we find that the ship lost 22·4 miles in speed by the use of sails alone, but saved 11·2 tons of coal, from which the ·75 ton used in banking being subtracted, she is left with a nominal gross saving of 10·5 tons of coal, and an actual loss of 22·4 miles in speed.

(*e.*) The method pursued in calculating the loss or gain by the use of square sails when steam is also in use is somewhat similar. Referring to the table, we see that on the 12th June the ship was four hours under steam and sail, and ran 31·9 miles in that time. Just before making sail she was going, under steam alone, 7 knots for 32 cwt., or 4·4 miles per ton. The use of the square sails in those four hours, therefore, increased her speed by 3·9 miles, and saved coal to the extent of 0·1 ton.

(*f.*) The value of sail-power is most conveniently spoken of in tons of coal; and throughout the tables the miles lost or gained on the passage are, at the end of it, turned into tons of coal at the rate due to each particular case. The same data are used to establish the gain or loss of miles or tons, and afterwards to convert miles into tons. Thus, the above 22·4 miles lost, at 5·3 per ton, gives 4·2 tons to be subtracted from the 10·5 tons appearing as saved, thus leaving the actual gross saving due to being ten hours under sail alone at 6·3 tons.

(*g.*) At the end of the Passage, all the particulars given in the tables are summed up, as in Table I. "Total consumption of coal for "engines" represents the expenditure for steaming, banking fires, raising steam, and waiting orders. The "consumption of coal, steaming" is the result of the sixth column in the tables, and is the coal actually used in propelling the ship over the distance given. The "consumption of coal for all purposes" includes every expenditure of coal for any purpose during the Passage.

(*h.*) The times, distances, and consumption of coal, being thus summed up, are used to take out the average speeds under steam alone, steam and sail, sail alone, and under all the circumstances of the

Passage. The mileage under steam alone; under steam and sail; and under steam, and steam and sail; is then taken out from the coal burnt under those circumstances. In calculating the mileage per ton on the Passage the consumption used is that for engines, including banked fires, laying fires, and waiting orders.

(*i.*) The total gross saving of coal by sails is the result of the seventh and eighth columns in the table, calculated as before mentioned. The gross percentage of saving on consumption, is calculated on the expenditure of coal for all purposes.

(*j.*) The abstract given in Table II is a summary of twenty-eight primary tables, of which a specimen is given in Table I, with some additions. Item No. 9, for instance, is taken directly from the engine-room registers, and gives the coal used for all purposes during the whole period covered by the table. Items 12 and 13 are taken out from the primary tables specially for the abstract. The "coal nomi-" nally saved by square sails," and the "miles actually lost by square " sails," are the sums of the seventh and eighth columns in the primary tables, while the "gross percentage" is taken out from the coal shown as used for the engines, and for all purposes respectively.

14. Table II thus represents the actual facts as to the relation between the propulsive values of steam-power and sail-power, in an ironclad on foreign service of a somewhat varied kind, during two full years of her commission. On these facts I base my conclusions as to the distribution of sail-power in the Fleet Ship, and I think it must be admitted that they are sufficient.

15. The most extraordinary fact brought out is given in item 26, where it is shown that on the whole no more than 7 *per cent.* can be put as the gross saving of coal due to the use of sails; and it is, perhaps, necessary to state that not a moment was ever lost in making sail whenever it was possible to use the square sails with effect. From this miserably small gross saving, all the *per contras* must be taken; namely, the loss due to the weight of masts, yards, sails, and ballast, the retardation due to the fixed area of masts, sails, and rigging when steaming against foul winds, as well as other losses not here to be adverted to. Thus, we see that on the face of things, and at the first blush of the matter, the sail-power *must* involve an actual loss of coal, and it only remains for us to calculate the amount of the loss as nearly as may be.

16. Let us take first the question of immersion due to weight. We know that masts, yards, sails, and ballast weighed together 520 tons —more than half the weight of the armour, and nearly half as much again as the weight of the guns and ammunition. Now, consider-ing the speed as given, the consumption of coal may be roughly assumed to vary as $D^{\frac{2}{3}}$, where D = displacement. Taking the existing displacement at 6,034 tons, and what it would be were the sail-power entirely removed at 5,514 tons, we have,

$$6{,}034^{\frac{2}{3}} : 5{,}514^{\frac{2}{3}} : : 5{,}162 : x,$$

5,162 being the number of tons actually used in steaming during the two years. This gives us $x = 3{,}861$ tons, which, subtracted from the

5,162 tons actually used, gives 1,301 tons as the loss due to the simple weight of the mast, yards, sails, and ballast. I may remark that these figures are quite confirmed by actual experiment in the ship on repeated occasions. The difference of coal consumption for a given speed, at different immersions, varied as nearly as possible in accordance with the above law.

17. But by Table II the gross saving due to the use of square sails was only 453 tons of coal. The net loss, therefore, due to the sail-power was 848 tons of coal from the item of their *weight* alone.

18. But a little reflection will show us that the case against sail-power is on this head alone still worse than these figures show it to be. In calculating the primary tables, whence the abstract in Table II is drawn, we have really put all the fair winds to the credit of sail-power, and all the foul winds to the debit of steam-power. This follows from the fact that square sail was invariably set whenever the sails would stand. Thus, we have supposed that whatever the strength of any fair wind might have been, it would not have helped the ship in the least, unless the square sails had been set. This is assuredly a most incorrect hypothesis, for a fair wind invariably makes an immediate increase of speed, as well as a reduction of consumption.

19. But passing this by, we have to assign some value to the loss of coal due to the resistance of the spars and rigging when steaming head to wind. I do not know of any precise data on this head, and I do not know of any means by which such data can be obtained, short of a long and varied trial of the same ship at first without her spars, but with a weight corresponding thereto; and afterwards with her spars complete—the corresponding weight being removed. Such an experiment we are most unlikely to have, and we must, therefore, assume some figure which will certainly be within the mark. The ship expended while under steam alone, 4,201 tons of coal in the two years. Is 5 per cent. too large an allowance? Supposing the ship going five knots, and a head wind sprang up reducing her speed to four knots, that would represent a common occurrence, in any ship of war, and would represent a total loss of 20 per cent., part of which would be due to the resistance of the spars and rigging, would it be unreasonable to say that one-fourth of the loss represented this part? I suspect that 5 per cent. is not an unreasonable allowance for loss due to resistance of spars and rigging when steaming over any considerable distance head to wind, or in calm. But to be safe, I should put it at about 4 per cent., or at 152 tons of coal. This makes our total loss of coal due to sail-power just 1,000 tons, or 500 tons a year; which, at an average foreign price, involves a money loss of £1,150 per annum.

20. As the total consumption of coal for all purposes was 6,734 tons, we find in answer to question *a*, in par. 11, that so far from the sail-power of such an ironclad as we have been considering, representing its equivalent in weight, it actually involves a loss of more than 14 per cent. We may, therefore, at once answer the second question, *b*, and say that looked at from this ground alone, a re-arrangement or re-distribution of sail-power is required.

21. We have next to consider whether the increased draught of water due to the weight of spars and sails, &c., is not a serious inconvenience to a war ship. This must, I think, be at once admitted. The 520 tons which sail-power and ballast represents in such an ironclad, is equivalent to about 16 inches of draught, and when I have said that, I have said all.

22. As to the inconvenience of full rig to a fighting ship in action, opinions will no doubt differ. We happen to have an instance before us, by way of experiment, which seems to cut so accurately both ways, as to leave the argument just where it stood. The German "Meteor," off the coast of Cuba in 1870, fought the French "Bouvet." The German planted a shell in the "Bouvet's" boilers, and, observing her helpless condition, ran down to make her an easy prey. But the "Meteor's" wounded masts fell and fouled her screw; rendering her just as helpless as her antagonist. The "Bouvet" then, by the use of her sails, crawled away into neutral waters and saved herself. On this experiment, one side will argue that had the "Bouvet" not been provided with a full rig, she would have fallen a prize to the "Meteor," while the other side will urge that had the "Meteor" been without rig, she would have captured the "Bouvet." I am content to leave these arguments where they stand, observing simply, that as each may be maintained with equal force of logic, I prefer to take up the ground put forward in my essay, which would give the "Bouvet" a second chance with her steam. If she had been so arranged that a single shell would not have absolutely paralysed her steam-power, she might have used her reserve steam-power to capture the "Meteor," rendered helpless by her supply of sail-power.

23. We come now to the lowest part of the question—I mean lowest in theory—but recent years have taught us that it may in practice become the most important of all. I mean the money question. We have already seen (par. 19) that we cannot put the direct extra expenditure of coal due to sail-power, at less than 500 tons a year, or at an average foreign price, at £1,150. We must clearly add to this, interest on original capital sunk in rig; and the wear and tear. I think I am within the mark—perhaps considerably—when I place the value of such a full rig as we are considering at £5,300, and if we allow interest at 4 per cent., we should get the annual cost put at £212. I suppose we cannot put the wear and tear at less than 7 per cent., which would give us a yearly charge of £371. We thus get the direct cost of the full rig put at £583, which, added to the indirect cost already calculated, puts the total cost of the sail-power as supplied to a second class ironclad as £1,733 per annum. When we turn to the Navy estimates for this year, we see that these figures thus applied to a single ship, cannot err very greatly when applied to the whole Navy. We find that the coals purchased at home for ships' use are to cost only £99,800, while hemp, canvas, and minor articles are to cost £137,400. It is true that much coal is purchased abroad, and that a considerable part of the £175,000 which is to cover all purchases abroad, will go in the one item of coal. But even if the whole of it went in coal, it would not upset the figures.

24. Up to this point, all the facts and arguments go to show that a re-arrangement of the rig of the ironclads is clearly desirable, if we are not prepared to send them to sea as practically mastless hulks like the "Devastation," which I for one am not prepared for. The question next to consider is, what should be the nature of this rig? Regarding the sail-power proper to be supplied to a ship of the type under consideration, as altogether subordinate and tributary to the steam-power, what distribution may be made of the former to give the greatest assistance to the engines at the smallest cost and inconvenience? It is to be observed that there are in the present rig two kinds of sails, the fore and aft, and the square. When the square sails are at their best, the fore and aft sails are at their worst, and *vice versâ*. Here there is direct loss; for the weight of each kind of sail becomes a drag when the other kind only is in use. Hence we should aim at such a description of sail as might be equally used whether before or close to the wind. Regarding the possible improvement of the rig of our ironclads from this point of view, we come to the question of areas of sail, which gives us some pretty subjects for thought. We may remember that "*area of sail*" is, for a given wind, an expression for sail-power exactly corresponding to the "*indicated* "*horse-power*," for steam-power. Reductions, or increases in area of sail, must be expected for any given wind, to represent reductions or increases of speed under sail, exactly corresponding to those due to equivalent reductions or increases of indicated horse-power, when under steam. This makes us recall to mind that a reduction in the area of sail will not effect a corresponding reduction of speed under sail. Then, if we start with the understanding that sail is not to be considered as a substitute for steam, but rather its assistant, then we can say that it is possible a reduced sail area will affect an increased speed, first under steam alone, and secondly under steam and sail, both because of the reduced displacement of the ship to be propelled. If we reduced the area of sail by one half, and found that we were thereby able to reduce the draught of water by one foot, it might turn out that the increase of speed due to this reduced draught was greater than the reduction of speed due to decreased sail area.

25. It must not be forgotten that a very great part of the weight of present spars and rigging is due to the existence of light and lofty sails. But practically these—unless we could adopt the sound policy of the mercantile sailing marine, and make our top-gallant sails the largest sails in the ship—are of exceedingly small propulsive power. At a time when such sails could be taken into account, as sensibly assisting propulsion, they must come in. Neither the canvas, nor the spars, are capable of meeting a fresh breeze. So that if we decided to considerably reduce the area of sail in an ironclad, we might, in the first place, not decrease the speed sensibly in light winds, while we might even increase it in strong winds by showing a greater area of sail than is possible under the present system.

26. Let us apply these considerations to the case in hand. The ship in question spread an area of plain sail equal to 24,092 square feet. With the wind abeam under sail alone, and when plain sail—

less royals, flying jib, and spanker—strained the spars to their utmost, I got a speed of 8·2 knots out of her, being the best she had ever done. The area of sail was then 19,169 square feet. If it had been reduced to 14,500 square feet, we should have had the following results, considering the areas of sail, as corresponding to their equivalent indicated horse-powers.

$$V^3 : v^3 :: A : a,$$

where V and v, are the speeds due to the original and reduced areas of sail; and A and a, are the areas themselves, the force of the wind being constant. Therefore:—

$$(8{\cdot}2)^3 : x^3 :: 19{,}169 : 14{,}500, \text{ and } x = 7{\cdot}47 \text{ knots.}$$

Then it has to be remembered that as this reduced sail area involves a decreased displacement, the loss of ·73 knots would very likely be lessened by the decreased area of immersed midship section. If, for instance, we reduced the weights carried by 460 tons, we should expect to reduce the loss to only ·6 of a knot.

Perhaps the most effective sail area is spread under the present system, when all studding sails are set on one side, with the lee clue of the mainsail. The area is then about 22,790 square feet, of which about 5,780 feet belong to the studding sails. When the strength of the wind is such that the royals and top-gallant studding sails cannot be set, and when topmast studding sail booms begin to go—the ship will make 8·5 knots, the area of sail being 19,862 square feet. A sail area reduced to 15,500 square feet, and a correspondingly reduced displacement, would give a speed under sail alone of 8·08 knots.

27. Actual experiments as to this, the equivalents of sail area and indicated horse-power, would form exceedingly valuable data, for we can say of no theory that it can be applied to practice until actual practice has taught us the fact. The few experiments I have been able to carry out give me no cause to doubt the practical utility of the theory. Thus, I found that when an area of sail equal to 25,617 square feet gave me a speed of 6 knots, an area of only 6,986 square feet gave me a speed of 4 knots. Increasing the area to 17,595 feet only increased the speed to 4·8 knots; and increasing it to 21,815 square feet brought the speed up to 5·5 knots.

28. Supposing, therefore, that on all the grounds set forth, it were determined not to withdraw sail-power altogether from the ironclad, but only to modify it, what is the best modification? I have, till better advised, pinned my faith on leg-of-mutton sails, arranged in a similar manner to those shown in the diagram. The main feature of the proposed rig is the abandonment of yards and gaffs, and the substitution of booms. In the diagram I have given in dotted lines the present rig of the example, and in black lines the proposed rig. The lower masts would be of iron, fore and main 78 feet from deck to cap, mizen 6 feet less, and all three of a diameter suitable to the greatly reduced strain which will be thrown on them. The booms should also be of iron, fore and main 76 feet long, mizen 69 feet long and of suitable diameter. The topmasts should be wooden, slight, in

correspondence with the small strain they are to bear. The booms, instead of resting on a saddle, with jaws round the mast, would work on a universal joint on an arm extending some little distance abaft each mast, and well stayed and supported. The object of this arrangement is to allow the booms to come perfectly square when against the after swifter. By means of these masts and booms, three triangular sails would be set, to be made say of No. 2 canvas. The fore and main alike, with an area of 4,270 feet to each, the mizen with an area of 3,379 square feet. Forward, a jib-boom without bowsprit would be rigged out 27 feet from the knight-heads, and carrying a jib of about 1,392 square feet in area. A staysail would set on the fore-stay as at present, with an area of 1,193 square feet. The total area of these sails would be 14,504 square feet, which, considered as a fore-and-aft rig, compares favourably with the present one, which is but 9,592 feet in area. To these standing sails would be added a single studding sail forward of a triangular shape, the tack to go to the lower boom end, the head to the topmast head, and the sheet inboard. The lower masts should be supported by three shrouds of a side, one carried well forward to act as stays, and one carried aft, but only to the line of the jaws of the boom. Each lower mast should also have the after support of a shifting backstay on each side to set up with a screw and slip, so that the weather one could always be in use. Topmasts would be secured in like manner.

29. So far as I am able to judge, the chief objection to this rig would be its novelty. We should find it difficult to divest ourselves of a longing for our accustomed spars and sails, and for our pretty morning and evening evolutions. No naval man can part with these old friends without a pang, and without sincere wishes that the progress of time, and of busy—perhaps too busy—brains would let us alone. But if these too busy brains *will* establish new conditions, it is most certainly the duty of the naval Officer to cast aside any regrets, and to bravely suit himself and his ideas to the new conditions which others have established for him. We did not of ourselves invent the steamship, nor yet the ironclad and her many-tonned guns; but these things being the tools put into our hands, it is idle to cast longing looks at those so familiar to us in a past age. We must resolutely set our faces and bend our minds to the task of fitting ourselves to the new implements, and we must not fear to forsake old methods and old ideas, so soon as they are shown to be obsolete. My experience of the naval Officer is that he can fit himself to anything, and that no material changes in his tools will alter his character, or make him less "naval" than he always was, and is now. Hence, although few in the Navy have the opportunity or the leisure to make such calculations as I have put before you, and although the many would not, for a long time, perceive the full bearings of my case, I am more deeply in error than usual, and have forsaken my ordinary methods of reasoning, if the idea of novelty attaching to the new rig would be very lasting.

30. But in order to meet such objections as may be raised at the outset, I may observe that I do not anticipate much difficulty in

working these sails, for, large as they undoubtedly are, the fore and mainsails only contain 530 feet more area than the present square mainsail, and any one who has had experience of a brig's boom mainsail, will recall to mind that the largest sail in the ship was the easiest to manage. I should propose that the feet of these boom sails should travel out with clips upon a T-iron feather running the whole length of the boom; and if there ever were difficulty in taking the sails in by an inhaul and brails, easing the boom sheet over would spill the sail and allow it to come in. Permanent braces, representing "lazy "guys," would lead from forward aft to each boom on each side of the ship, but would not be brought into use until the booms were eased well over. The boom sheets would be double, one on each side, so as to steady the booms when near the wind. Both braces and sheets, instead of being attached in the usual way, would be run out to the boom-end, or to suitable positions by means of outhauls; the blocks being hooked to clips travelling on T-iron feathers on each side of the booms. In this way, braces and sheets could be hooked and run out, or run in and unhooked as might be necessary. Topping lifts would be fitted double, in the usual way.

The main and mizen booms would form the derricks for hoisting boats in and out. The fore boom would require topping to clear the funnel whenever the tack was changed, bnt I believe this would not be a serious inconvenience.

The boom sails would have the usual three reefs, but I think it would be preferable to fit them as the reefs of square sails are now fitted, with beckets and toggles on the travelling clips, the slab reef being gathered in by slab lines, as in the square sails. I should not think it necessary to fit storm sails, as the reduction of sail due to reefing would be so great. The luffs of the boom sails would travel with hanks or lacings on a wire jackstay coming down from the topmast head, set up to the deck, and supported at intervals by arms from each side of the mast.

31. Having thus detailed the facts of the relations between steam and sail power in our existing Fleet Ships, and having described the modifications I propose in the arrangement of sail-power to agree with these facts, I may pause a moment to recapitulate. In reducing area of sail, and altering the rig, I have, in the first instance, reduced the heeling power of the sails; and, secondly, the length of the lever at which that power acts. The centre of effort in the new rig is 23 feet below its place in the old one. All this means that the 360 tons of ballast placed in this class of ship may come out if the new rig is adopted, and as the latter will weigh about 100 tons less than the old rig, we find that we have freed the ship of no less than 460 tons of dead weight. Under present arrangements, such a ship is unable to steam 1,500 miles against a head wind, by reason of her short coal supply; I should certainly look on the work as but half done if none of this spare weight were taken to increase the coal supply. Say that the ship now carries 460 tons of coal and steams 4 miles per ton, she then has 1,840 miles in her bunkers; add 100 tons, and we give her 2,240 miles. But then, as we remove 360 tons of dead weight, while

we give her this 100 tons more coal, it is certain that we shall increase her mileage per ton very largely. But if we increase her mileage per ton, it is also certain that we shall increase her speed per ton, and hence she can either steam a longer distance at her present speeds, or the same distances at increased speeds. Hence, if the power of locomotion is an important factor in the Fleet Ships, the appeal I have made to fact shows us how to get it. In the matter of mere money saving, the case is perfectly clear in the new rig. It will cost less to begin with; its wear and tear will be less; and its drag upon the steam-power will be insignificant. Whenever the wind is fair and strong, the new sails will give her very nearly, if not quite, as much help as the old ones, but the loss when the wind is foul and strong will not be noticeable. This is the favourable side of my argument. There are very important *per contras*, as every one knows, but I shall not advert to them at this moment.

32. In my essay I have taken up the strong ground of recommending the new rig for every ship in the Navy. That I have done in order to raise a distinct issue, and I should have held myself in order had I raised it without any more facts than those already stated at my back. But though my facts are by no means complete, I can produce some which go far to justify me in believing that those which I have given in relation to the Fleet Ship will be found more or less applicable to every ship in the Navy. That is, that in general, the propulsive power of our square sails, put into competition with the steam-power, does not reach the loss involved in their weight, in their retarding power in foul winds, and in the consequent diminution of coal supply.

33. I have taken as my example a sloop whose steaming powers were low, but whose sail-power was about four times as great in proportion to displacement as that of the Fleet Ship, and I think that she must under these circumstances give data which will at least go to justify my views. In the first passage of this ship examined by me she went from Malta to Port Saïd, 1,029·8 miles through the water, of which 644·1 were done under steam alone, and 385·7 under sail alone. She burnt 22·6 tons on the passage, and her nominal saving of coal by the use of her sails was 19·1 tons; but she lost 241·0 miles in speed by her sails, so that her gross saving was only 7·6 tons. In her next passage from Suez to Aden she made 617·8 miles under steam alone, and 805·3 miles under sail alone. She nominally saved 33·5 tons of coal, but as she lost 374·7 miles in speed by using her square sails, her gross saving was only 11·3 tons. Her next passage from Aden to Trincomalee is the most favourable for sail-power that I have yet met with. She only steamed 494·9 miles, while she sailed 2,051·6 miles. She saved 94·2 tons of coal, and gained 64·1 miles in speed, so that her gross saving of coal was 97·1 tons; and while she only burnt 22·7 tons on the passage, it may be said that she must have burnt 119·8 tons had she not had sail-power. But this is just the point which I offer for discussion. The ship on this passage ran before the strength of the monsoon for fourteen days out of the twenty-two occupied in all. She never had, from first to last, any head winds unless they were very light, and so she had all the advantages of her sail-power, and none of its disadvantages. Now I must observe

that the exigencies of war cannot wait for fair winds, and that had this ship been ordered by such an exigency to retrace her steps, she could not have done it, and the reason why she could not have done it was because of this very sail-power which has here so much benefited her.

34. But passing this by, let us note how exceedingly unfair on the side of sail-power we have been in our estimate of her gross saving of coal. The datum on which it is calculated is the steaming power of the ship against a light foul wind. If the ship had crossed in the north-east monsoon instead of the south-west, and had met light foul winds the whole time, then she could have steamed at the same speed as she now ran before the wind, from Aden to Trincomalee, for 119·8 tons of coal. It is clear, however, that even if my example had had no sail-power whatever, she would not have used that amount of coal in the south-west monsoon, for the fair wind would have both quickened her speed and reduced her consumption. On the other hand, with the lighter and reduced rig which I propose for her, her speed under sail alone would not have been greatly reduced, while had she made the passage under steam and sail, which would, in my view, be the normal condition under the circumstances of this passage, she would have spent but little coal, and would have greatly increased her average speed. The ship was a twin screw, and I believe it may be assumed that with a single screw going, and fore-and-aft sails set, a twin screw may expect to double her mileage per ton at ordinary speeds. In the Fleet Ship it was so, and if it would be so in my present example with her new rig, we must suppose that she would have got 44 miles per ton of coal, and would have spent but 57 tons on the passage. Probably, also, her average speed, instead of being but 4·8 as it was, would have reached 6 knots or more. But the strong point of all is that the ship as she stood would have been unable to steam from Aden to Galle in a calm, whereas with the reduced sail area and increased coal supply, which I propose for her, she would have done so with ease.

35. As I have pointed out in my essay, I found that the sail-power of this vessel when traced through a distance of 6,100 miles actually reduced her speed 14 per cent., and that it was impossible to raise the gross saving of coal—even allowing nothing for her reduced speed—above 37 per cent. If we consider that this ship was unable to face, under steam alone, a breeze to which she could show all plain sail, we get a very strong feeling that the gross saving—even were it nett—would be too dearly purchased. When again I extended my investigations to fifteen months of this vessel's service, I found that her gross saving kept continually falling, and could not be raised beyond 5 per cent. for general service. Against this must of course be set the *per contras* already mentioned, so that we are able to say with some confidence, that the sail-power of this ship reduced her speed, and cost the country more than if it had not existed, and the ship had been mastless.

36. I have another set of eight tables taken for a single screw ship of rather under 900 tons, whose sail area was about 9 square feet per ton of displacement. The sacrifices she made in favour of sail-power

were draught of water and armament. She drew 5 feet more water than the ship just examined, was half as large again, but her armament only weighed 16 tons 2 cwt. against the other's 11 tons 7 cwt. In calm this ship could get 4 knots, with a mileage of 30 to the ton, but in head winds she fell off to 14, and $8\frac{1}{2}$ miles per ton. The ship had a lifting screw, and perhaps it may be said that in her, sail-power *versus* steam-power had their case dismissed, each being as fully developed as the interest of the other allowed. A fair wind without sail would raise her steaming powers to 7 knots, and 43 miles to the ton. I traced this ship over about 10,800 miles of water, and got a gross saving of 111 tons of coal out of 441, or a gross saving of 25 per cent. But as to effect this gross saving, she lost 722 miles, or nearly 7 per cent. of her speed, it is more than probable that the real gross saving of coal was inconsiderable, and that there would be no nett saving, or perhaps a nett loss, when the increased displacement due to at least 30 tons of rig, and its retarding effect in head winds, was brought to account.

37. On the whole, it must I think be admitted that though I may be rash in committing myself to the abandonment of the square rig of our ships of war, my rashness has some method in it, and that it is not altogether impossible that I may be right.

38. Some paragraphs back (par. 31) I spoke of the facts and arguments which lie against the position I have taken up, but I have thought that those would come better out in discussion, and in this paper I shall not raise them.

TABLE I.

Date.	Hours under weigh.	Distance under			Coals burnt.	Coals saved or lost.	Miles gained or lost.	Remarks.
		Steam alone.	Steam and sail.	Sail alone.				
					Tons.	Tons.		
June 2	19	101·1	..	..	17·6	..	..	[1] Two hours steaming round target.
„ 3	24	74·8	..	..	23·7			
„ 4	14	47·7	..	..	13·8			[2] *Data.* Under steam alone in calm on 6th and 7th, 6 knots for 35 revolutions, and 22·5 cwt. = 5·3 miles per ton.
	10	..	..	37·6	..	+10·5	−22·4	
„ 5	3	..	..	5·5	..	+3·3	−12·5	
	1	..	5·0	..	0·9			
	12	57·7	..	..	11·9			
„ 6	8	48·0	..	..	8·4			
„ 7	11	61·6	..	..	11·7			
„ 8	4	19·0	..	..	3·9			[3] *Data.* Just before making sail, 7 knots for 42 revolutions, and 32 cwt. = 4·4 miles per hour.
„ 10	16	91·1	..	..	16·6			
„ 11	24	132·6	..	..	26·5	..	..	
„ 12	13	79·8	..	..	19·1			
	4	..	31·9	..	6·2	+0·1	+3·9	
Totals .	163	713·4	36·9	43·1	160·3	+13·9	−31·0	

Total distance through the water	793·4 miles.
Time under steam alone	145·0 hours.
„ „ „ and sail	5·0 „
„ „ sail alone	13·0 „
Total consumption of coal for engines	181·0 tons.
Consumption of coal steaming	160·3 „
„ „ for all purposes	196·2 „
Average speed under steam alone	4·9 knots.
„ „ „ „ and sail	7·4 „
„ „ „ sail alone	3·3 „
„ „ on passage	4·8 „
Mileage per ton under steam alone	4·6 miles.
„ „ „ „ and sail	5·2 „
„ „ „ „ and steam and sail	4·6 „
„ „ on passage	4·2 „
Total gross saving of coal by sails	8·2 tons.
Gross percentage of saving on consumption	4·1 „

Table II.

Abstract of Tables showing the Value of Sail-Power in H.M.S. "Audacious," for the two years ending 28th October, 1876.

1.	Total distance through the water	23,304 miles.
2.	Distance under steam alone	16,039 „
3.	„ „ „ and sail	5,430 „
4.	„ „ sail alone	1,835 „
5.	Total time under weigh (4,858 hours)	202½ days.
6.	Time under steam alone (3,351 hours)	139½ „
7.	„ „ „ and sail (920·5 hours)	38½ „
8.	„ „ sail alone (576 hours)	24 „
9.	Total consumption of coal for all purposes	6,734 tons.
10.	Consumption of coal for engines	5,568 „
11.	„ „ steaming	5,162 „
12.	„ „ under steam alone	4,201 „
13.	„ „ „ „ and sail	962 „
14.	Average speed under steam alone	4·78 knots.
15.	„ „ „ „ and sail	5·89 „
16.	„ „ „ sail alone	3·19 „
17.	„ „ „ all circumstances	4·79 „
18.	Mileage per ton under steam alone	3·81 miles.
19.	„ „ „ „ and sail	5·60 „
20.	„ „ „ „ and steam and sail	4·15 „
21.	„ „ „ all circumstances	4·18 „
22.	Coal nominally saved by square sails	553 tons.
23.	Miles actually lost by square sails	530 miles.
24.	Gross saving of coal by square sails	453 tons.
25.	Gross percentage of saving on consumption for engines	8·13 per cent.
26.	Gross percentage of saving on consumption for all purposes	6·72 „

Table III.[1]

Abstract of Tables showing the value of Sail-Power in H.M.S. "Hart," a twin-screw gun vessel. From April 1st, 1874, to June 30th, 1875.

1.	Total distance through the water	11,921·8 miles.
2.	Distance under steam alone	6,588·9 „
3.	„ „ „ and sail	754·8 „
4.	„ „ sail alone	4,578·8 „
5.	Total time under weigh (2,473·5 hours)	103 days.
6.	Time under steam alone (1,222·5 hours)	51 „
7.	„ „ „ and sail (165·0 hours)	7 „
8.	„ „ sail alone (1,086·0 hours)	45 „
9.	Total consumption of coal for all purposes	613·6 tons.
10.	Consumption of coal for engines	496·4 „
11.	„ „ steaming	434·9 „
12.	„ „ under steam alone	390·1 „
13.	„ „ „ steam and sail	44·8 „
14.	Average speed under steam alone	5·3 miles.
15.	„ „ „ „ and sail	4·5 „
16.	„ „ „ sail alone	4·2 „
17.	„ „ „ all circumstances	4·8 „
18.	Mileage per ton under steam alone	16·8 „
19.	„ „ „ steam and sail	16·8 „
20	„ „ „ steam and steam and sail	16·8 „
21.	„ „ „ all circumstances	24·0 „
22.	Coal nominally saved by square sails	229·0 tons.
23.	Miles actually lost by square sails	1,109·2 miles.
24.	Gross saving of coal by square sails	163·6 tons.
25.	Gross percentage of saving on consumption for engines	32·8 „
26.	Gross percentage of saving on consumption for all purposes	26·6 „

Note.—On the last 5,824 miles, which represent "General Service," the ship burnt 388·4 tons of coal for her engines, and only saved 6·4 tons, or less than 2 per cent., by the use of her sails.

Table IV.

Abstract of Tables showing the Value of Sail-Power in H.M.S. "Egeria," a single-screw sloop, with a lifting screw. From November 2nd, 1874, to June 30th, 1875.

1.	Total distance through the water	10,832·0 miles.
2.	Distance under steam alone	6,708·2 „
3.	„ „ „ and sail	471·0 „
4.	„ „ sail alone	3,652·8 „
5.	Total time under weigh (2,127·5 hours)	89 days.
6.	Time under steam alone (1,275·5 hours)	53½ „
7.	„ „ „ and sail (63·5 hours)	2½ „
8.	„ „ sail alone (788·0 hours)	33 „
9.	Total consumption of coal for all purposes	441·3 tons.

[1] Tables III and IV have been added by Captain Colomb, since the paper was read, in order to make it more complete.—Ed.

10.	Consumption of coal for engines	339·7 tons.
11.	„ „ steaming	306·2 „
12.	„ „ under steam alone.....	292·6 „
13.	„ „ „ „ and sail.....	13·6 „
14.	Average speed under steam alone	5·2 miles.
15.	„ „ „ „ and sail.....	7·4 „
16.	„ „ „ sail alone	4·6 „
17.	„ „ „ all circumstances.....	5·0 „
18.	Mileage per ton under steam alone	22·9 „
19.	„ „ „ steam and sail	34·6 „
20.	„ „ „ steam and steam and sail ...	23·4 „
21.	„ „ „ all circumstances.....	31·3 „
22.	Coal nominally saved by square sails	124·1 tons.
23.	Miles actually lost by square sails.....	723·5 miles.
24.	Gross saving of coal by square sails	111·0 tons.
25.	Gross percentage of saving on consumption for engines.....	32·6 „
26.	Gross percentage of saving on consumption for all purposes..	25·1 „

Admiral Sir SPENCER ROBINSON: I am sure we have all listened with the greatest interest to the very valuable, well written, and well considered paper that Captain Colomb has been so kind to read to us. The calculations that he has entered into, and the figures on which his theory is founded, fully justified what he said just now, that if he was a little rash, there was method and very considerable method in his rashness. I am sure all of us who have the pleasure of knowing that Officer, and who have heard him lecture and discuss subjects in this theatre, must have been perfectly prepared for something extremely valuable and interesting when we knew that he was to come here to-night. For my own part I felt perfectly certain that I should hear something which would be exceedingly instructive, and would powerfully aid either in confirming or disproving certain theories which I myself had held for a considerable period, and had had some power of carrying into practice. Captain Colomb began by observing what I know to be perfectly true, that he was particularly struck by the change that had come over the minds of most Naval Officers during so short a period as four years relative to the utility of sail-power, and to the principles to be adopted in masting our ships. I for a long time, far longer than the time he mentioned, have held very much the theories that Captain Colomb has so ably set forth to-night, and I have long been persuaded that the time was certain to come when that love of our spars and sails, that certainly does belong to every sailor, and from which, as he so justly said, we cannot part without regret, must be dismissed as a thing of the past. Such lectures as we have heard to-night will go further to establish in the minds of all those who reflect, and who are not led away simply by mere verbal expressions, that we may pay very much too dearly for our masts, and we may by the adoption of wrong principles deprive ourselves of the very special and far greater power without which our ships of war are entirely useless—even when we apply only such masts and yards, and make such moderate use of sail-power, as our ironclads are of necessity reduced to. I have no doubt myself, that although not likely for some little time to find favour in the naval world, the theory and principles which Captain Colomb has laid before us will go further than he as yet is willing to go, and having found him come round to the ideas that I held some twelve or fourteen years ago, I am perfectly sure that in process of time he will advance to its full application, to which I will just advert in passing. Captain Colomb stated, that he was not an advocate for absolutely mastless ships, whereas I believe and am confident that, for certain purposes of war, the absolutely mastless ship will prevail over all others. I am certain of this, that the misery and distraction of insufficient coal supply, and the absolute incapacity an Officer often finds himself under to work to the best advantage the powerful engines that are now put into the modern ironclad, are often owing to this: that these masts prevent the engines, as Captain Colomb has shown us very clearly, from doing the work which they ought to do, and

that in the hour of action and the day of need, far from being enabled to trust to these masts and spars taking us out of action, they will destroy that efficiency of our propeller and of our artillery through which alone we can hope to win the naval battle of the future. Many of the points touched upon by Captain Colomb I can corroborate in a very marked way. During the time I was at the Admiralty we had repeated trials of ships without masts, and trials of the same ships masted. The comparison was remarkable in the sense that he has laid before you to-day; the loss from masting the ship was extraordinary, and the actual loss of speed at the measured mile in many instances amounted to far more than the 5 per cent. that Captain Colomb has stated. The only point connected with the masting of ships, and with the increased displacement consequent thereon, that Captain Colomb adverted to which I do not feel perfectly sure about is this: it is not always the case that lightening the ship, and diminishing the immersed area of midship section, causes the speed of the ship to be increased, or causes the mileage per ton for weight of coal burnt to be increased. In some instances, though by no means in the majority of cases, quite sufficient is known to make one feel the impossibility of agreeing with the theory that every time you lighten the displacement of the ship, you add to her speed and diminish her coal consumption, because there are so many cases in which we find that ships more immersed, that is, with greater load as it were to drive through the water, greater area of midship section, go faster than they did in their light state, and the reason is not far to seek. Owing to Mr. Froude's experiments, and owing to the scientific analysis and investigation of such gentlemen as my friend Mr. Scott Russell, we are much better acquainted than we were with the resistance offered by the water to propulsion, and have seen that the screw working in deeper water has sometimes a greater propelling and a more efficient power notwithstanding the greater load that it has to propel. But though I say that there are many instances, and there appears to be a good reason in many cases for what I now say, that the absolute displacement of a ship will not always be the measure of her speed and coal consumption, and that lightening the ship may not absolutely produce the best result in propelling her, yet the advantages Captain Colomb has put before you of removing the enormous weight of two or three hundred tons of masts, rigging, sails, and stores will, in the majority of cases, be found to exist, and even retaining the same amounts of weight, two or three hundred tons applied either in armour, coals, or armament, would give us advantages of which we are entirely bereft by the application of sail-power. The safety of ironclads has often given us some concern. Doing away with the masts of these ships at once removes all fear as to the comparatively high position of their centre of gravity, which has been often entertained with some little reason for doing so. The load upon all ironclads is necessarily higher, and necessarily raises the centre of gravity more than it is raised in ordinary ships, and if we add to that, sail-power, we may perhaps place our ships, when their angles of inclination are large, in an uncomfortable and dangerous position. By doing away with these masts and yards, we need not hesitate to put our weight exactly where it is most convenient, in order to make a formidable ship for offensive or defensive purposes. I quite follow Captain Colomb's very lucid tables, which explain precisely the data on which he calculated that the square sails of a ship did not afford any saving of coal, inasmuch as the saving of coal was more than counterbalanced in some instances by the reduced speed. There was one case I thought had escaped him, that is of a ship making a long passage with a fair trade wind—a case that will be familiar to all of us yet I think. The description of that vessel that went from Aden to Trincomalee very much met what had occurred to me, and removed, as I thought, an objection which I should have taken to some of the calculations that Captain Colomb brought forward. The fact is this: take, for instance, the flag-ship in the Pacific; she had a passage to make from Valparaiso to Callao. She has during that 1,400 miles run an invariable fresh strong wind, and I thought he had rather overlooked the use of sail in such a case. She would never light her fires, but the use of her sails would take her that journey with a complete and thorough saving of coal. I thought that proved that there might be cases in which the square sails of a ship, baneful as they are to her in various ways, might still in some circumstances prove an actual advantage; but when I heard Captain Colomb's lucid manner of turning those miles into tons of coal, I began to think he

had not overlooked any part of the argument, and as far as I could follow him, his deductions about coal power, the number of miles due to a ton of coal, saving of coal, and loss of speed, were fairly stated. He has not been tempted to overrun his argument by taking only the favourable side of the question, but he gave us in that case of a ship running before a monsoon, precisely the case that had occurred to me of a ship running before the trade wind; and on a review of the whole subject the question is settled entirely, in my opinion, in favour of the non-carrying of square sails—not carrying sails at all I should like to say, but it is too early at present to insist on that—those who come after me will, I believe, advocate that course, but I do not expect to see it adopted in my time. The last thing that I shall revert to is this. I know by the description Captain Colomb has given, that in almost all the cases in which he has been trying the speed of ships under sail, there has been that miserable drag of the screw to contend against. In the case of the ship he himself commanded, I think there were two screws, which had to be dragged after her, and all the sail-power in the world is fruitless and helpless to get anything like the proper speed of a ship from her while dragging her two screws, together with the various contrivances which I think I know pretty well were not perhaps as good in that ship as they might be made; she was constructed in the early days of twin screws, so that she is not a very favourable specimen of what a ship could do under sail. When, for instance, something in the course of the argument as to sail-power *versus* coal, Captain Colomb had to state that under favourable circumstances no more than 8¼ knots could be got under sail out of the ship while dragging the screws; there is no doubt that with those screws raised he could have got 11¼ knots, but the nature of the case which rendered that impossible to do, also made the comparison less favourable than it might prove in ships possessing that power. I am sure I need only say that we have had the greatest possible pleasure in listening to what Captain Colomb has said, and as far as I am able to judge of such matters I concur most heartily in the principles he has urged.

The CHAIRMAN: I think it would be desirable if some Officers present this evening, who have recently commanded ships, will favour us with their views on this subject. I see Captain Tryon present.

Captain TRYON: I had recently the honour of commanding a frigate that would steam 15 knots and sail still faster. The only part of this very able lecture which I shall somewhat venture to criticise relates to the tables which I see before me.. The speed is so miserably slow. I see the speed "under sail" is 3·3. If those are the conditions under which sail is set, it is hardly worth counting, considering the great disadvantages attached to carrying those yards and spars with their excessive weights and incumbrances. Looking at Table II there is a gain of coal of somewhere about one-tenth, owing to the use of sails, but there is a column here set down as "miles actually lost through sails"—580 miles. It appears to me just possible that you do not want to go that distance. A man-of-war is not always making passages; she is sent out to cruize; it is necessary for her to retain in her bunkers that amount of coal in order to chase an enemy, therefore I do not think it is quite fair to write off that coal. It appears to me that the question raised to-night is one of the most difficult problems we have to deal with in constructing men-of-war, and I think, so far as young Officers in command at the present day are concerned, that immediately we heard it was time to look around us on service, we nearly all of us asked to get rid of everything above the outer works. We do not like the masts at all; we go as far as Sir Spencer Robinson, and say we want no masts whatever. I think that is the opinion of a very large number of us, that they will be of no assistance whatever to us in action, and that is the time when we have to consider what is best for our ships. On the other hand, there are circumstances on very long cruizes, such as Sir Spencer Robinson referred to, where the sails in a frigate, such as that I had the honour to command, are undoubtedly of enormous value. I could go from England and make a very rapid passage, not at these 3 knots, but at a very high speed, right away to the Pacific, and carry the larger portion of my coal in the bunkers. It is perfectly true if I had not had these spars and 20-ton masts the weight would have been put in the ship in the shape of coal; but still that coal would not have taken me that distance, and would not have kept me so long at sea, had I been cruizing, and that coal I should have had, could be replaced by floating coal depôts in the shape of

powerful colliers. I think we do want for the great Navy of England, vessels that will have sail as an auxiliary power, to keep them at sea for long cruizes; but for our men-of-war in the Mediterranean and near at home we want nothing beyond flag-staffs higher up than our bulwarks.

Sir SPENCER ROBINSON: I entirely agree with what Captain Tryon said. I meant to confine the remarks I made to ironclads and not to men-of-war generally, such as cruizing ships.

Admiral HAMILTON: The few observations I have to make will apply to cruizing ships and not to ironclads, and with regard to those I will give a few cases in my own experience. It was my misfortune to get my ship on shore on one occasion at a distance of 600 miles from Havana, the nearest coaling station. We were obliged to throw nearly all the coals overboard to get her off, and then if she had had no sails I do not know where we should have been; we should certainly have been in a mess. On another occasion we got on shore on the Labrador coast, and there we had also to throw the coal over. If we had not had sail-power to fall back upon, we should very probably in that case have landed on an iceberg, or been frozen in for the winter. Of course, if any of us take up a hobby, you know you may prove almost anything from figures, and it is impossible for us to gainsay those figures now before us. Everybody knows the mathematical paradox $\frac{0}{0} = 1{,}000$, or any number you please; but practically you divide nothing by nothing and it is equal to nothing. Although those figures may apply to the twin screw ironclad which Captain Colomb commanded, I do not at all think they apply to our ordinary cruizers. I myself do not think the day has yet come for the abolition of sails for vessels on foreign stations. I should like to know what our gallant lecturer could have done to put down slavery on the coast of Zanzibar without the use of sails, because we know that boilers and engines of ships do break down occasionally. There are some very important lines of Transatlantic steamers going out of Liverpool, and every one of these liners is sparred and masted to a very fair extent. I have made six passages across the Atlantic in them, and I found they never lose an opportunity of making or shortening sail. In these, the Cunard, the Inman, and the White Star lines, we find more attention paid to making and shortening sail in full power steamers than we do in the Royal Navy. Depend upon it, it is an economic gain to these firms, or they would not keep those sails and make use of them as they do. Not only that, but in going out to the westward in the winter time they never send down the topgallant mast, as they said, "The stick aloft makes "no difference; it is the sea that brings ships up to a great extent, and not the wind." I think there is another point in which the use of sails is still beneficial, and that is when we have to make our sailors or keep the knowledge. We do not want them to be mere drilled machines. In war time the work the seaman has to do develops his individuality, but in peace time, you want masts and spars for the purpose of drilling men in their own line. Before masts and sails can be abolished, we must have a sufficiency of coal stations to meet all wants and exigencies, which we have not at present, and boilers and engines ought never to break down. Scarcely a quarter of a year elapses without our reading accounts of broken-down engines and the vessels returning under canvas.

Admiral RYDER: I have very few observations to make, and I, for the last three years, have sailed in the ship the lecturer has been speaking of, and we have very often talked this matter over. He would like to unrig the "Audacious," or partially unrig her. If her hull had been so designed as to enable her to carry more sail, I should have liked to have seen her more fully rigged. But as she was designed, she could not have been more fully rigged, because she would not have been safe. I have not yet heard from designers of ships that they cannot design a vessel that would be a good ironclad, and suited for foreign cruizing. I am not talking of "Devastations" for Channel work; but for vessels to go to the Pacific I believe our designers (Mr. Reed has assured us in his evidence before the Committee of Designs that he can do so) can design a thoroughly useful cruizing ironclad—which will also be a full rigged ship—capable of working to windward at least one mile an hour under all plain sail. The "Audacious" as she was rigged (I quite agree with Captain

Colomb), could not do so. I remember his getting her under weigh in an open anchorage, and being unable to have her under sail alone because she was quite unmanageable; but that is not a sufficient proof that an ironclad for distant foreign service cannot have a proper sail equipment if she is so designed as to carry it.[1]

Admiral SELWYN: There is no earthly reason why we should have such failures both in steaming and in sailing, as that vessel brought before us. All the percentages would come out totally different if we had had a decent performance either under sail or steam. I quite join with the writer of the paper in thinking that we might easily substitute fore-and-aft sails of great power, and fore-and-aft masts for the heavy yards we carry now; and if those masts were made of steel, and therefore without the necessity of rigging to support them, if they were made telescopic in shape, so that they could be lowered in the event of your going into action, then I say you would get a perfect sailing ship and a perfect vessel under steam. In the item of steam, I am happy to say, I know perfectly well that this year you will see the power of your coal doubled; but I do not know when you will see steel masts put into ships with proper sails, such as will drive a ship well shaped as she generally is under water, in spite of her screws, at a very fair rate, certainly not less than 10 knots on a wind, and probably from 12 to 13 off the wind. That is a result which you ought to get, which you can get, which there is no earthly reason why you should not get, except a bad disposition of weights on board the ship which makes her liable to capsize if you put sail on her. I join with Admiral Ryder in saying that our naval architects will tell us with one voice, that whatever we ask them for in that way they will give us. Mr. Scott Russell has very often said, "It is for the naval men to tell us what they want, and it is for us to do it." And I am quite sure he and others have sufficient talent to give us a good ironclad capable of steaming not less than 15 knots, and of sailing 10 knots on the wind, and from 12 to 13 knots off the wind. Then I think we shall acknowledge that the sail is worth having, but put before us in this way, the sail is not worth having, it is a doubt whether even the steam is worth having which the vessel did carry. Who on earth since Noah's ark was built, ever thought of going about the sea at four knots an hour? I say it is a ridiculous failure, and in that way we ought to look at it and to be ashamed of it, and to say we can do much better. Does anybody believe the existing mode of putting armour on above the water is likely to be of any great use to us? For what purpose do we raise the weights in a ship until the ship is scarcely able to stand on her legs? Simply to put armour round guns which would be much better under water where the water as armour would be efficient against guns of whatever size, and at all times. I admire very much the accurate observations Captain Colomb has given, and the way he has put his figures together; but I demur entirely to the conclusions he deduces from them. I demur entirely from drawing any such conclusions as Captain Colomb draws, namely, that the ship was a fair representation of a steam or a sailing ship. Turning to the rig that Captain Colomb proposes, I admire very much indeed the idea of fore-and-aft rig; it has been a favourite of mine for many years, but I do not like his taking away the body sail of the ship, and that is what you do if you put three jury masts with fore-and-aft sails into a large ship; you make her incapable of turning or doing anything else under sail. I had a very interesting instance of it in a screw steamer, which I commanded on the coast of Africa. Her speed under sail with screw down—it was always screw down—was 7½ knots on the wind, and she got to 9 or 10 knots off the wind. The Admiralty allowed me on coming home

[1] I desiderate to the same extent as Captain Colomb a sufficient coal stowage. 6,000 miles in the bunkers at 5 knots is what I should insist on. The "Audacious" had not 2,000; but until our coal depôts are properly distributed and protected, I ask for an *efficient rigged* type of ironclad for distant cruizing—say a full rigged "Northampton." A few feet more beam would probably give her the required additional stability, and the additional displacements to carry the additional weight of masts, stores, men, and provisions required, without lessening her stock of coal or her speed under steam. According to Mr. Froude's dictum, the steadiness of platform, the "Audacious'" distinguishing merit, would have, perhaps, to be secured in a full rigged "Northampton" by larger side keels.—A. P. R.

to put a centre mast placed very nearly as that is; but instead of having small sails the sheets of the fore-and-aft sails that I had, came one-third of the distance abaft the next mast aft of it. That ship afterwards, with her screw still down, beat the fastest Symondite brigs on the coast. She would always do her work perfectly well, having a beautiful bottom with very fine lines. There is no doubt whatever that if you give them proper sail every one of our ships will go as fast as the fastest ships that we ever had before. As to the placing of the ballast it is not entirely on account of the masts and yards, but because the initial stability of the ship is too small even without taking into account, &c., the sails, and therefore cement and bricks had to be put in to keep these vessels on their legs. There was the error, and it is an error which I hope will never be repeated again. I am perfectly certain when we get fore-and-aft sails—of which the fore and mainsails shall occupy nearly the entire space up to about 60 feet from the deck between the two masts, which is what they ought to do—you will then return to your ironclads which will wear and stay quite as well as our old ships used to do in spite of the screw and all the other disadvantages. I ask the Naval Architects for a perfect sailing ship and a perfect steamer as an ironclad, and I do not recognize any difficulty in supplying it.

Mr. Scott Russell, F.R.S.: I prefer, very much, on these subjects to have the opinion of naval men rather than to intrude the opinion of a ship-builder. You will, perhaps, be horrified to hear that I am a great lover of sails, and I should infinitely prefer making a voyage in a sailing-ship to making a voyage in a steamer. But I am bound to say to you that I can contribute what I said the reader of the paper is very fond of, facts derived from experience in merchant steamers of the substitution of steam-power for sailing-power, which are much more in accord with Captain Colomb's paper than I like them to be. I was asked to build a steam ship for trying the experiment of substituting steam transport entirely for heavy cheap materials, instead of sail transport. I am obliged to confess what I do not like. I am obliged to confess this to you, that for such common purposes as sailing between England and ports of 400, and 500, and 600 miles, in common vulgar trade, we very soon found out that a steam ship, trusting entirely to her steam, and having scarcely any sails, cost far less money per voyage, and earned much more money per annum, than all her additional coal expenses. And the result I can tell you, in a few words, to be this, that on those trades average sailing vessels only made a voyage once a month in the average of the whole year, steam ships made a voyage once a week all the year round. I therefore say, as a conclusion of experience, that, if a ship is going on a voyage on which steady speed is of any value, then on such work as that, steam does answer the calculations which have just been made, and steam is much cheaper than sail. But, at the same time, let me go back to my old prejudices. Captain Colomb does not propose to do away with sails altogether; he proposes to have sails, and to use those sails in such a manner as shall give the greatest advantage with the least inconvenience. Allow me to add my opinion, as a sailing-ship constructor, to Admiral Selwyn's opinion, that it is possible—if you will allow me to say so, it is easy—if you abandon certain existing plans, to build a man-of-war which shall be able to carry a very large quantity of canvas so conveniently, and with so little impediment, that if you will only give up your present modes of carrying that canvas, and will carry it in modes suitable to the new conditions which steam has raised, you can make a vessel carry a good deal more canvas than Captain Colomb has shown in his proposal, but on something like the same principle, with great advantage and with no inconvenience. While, therefore, I am sure that trusting more and more to your steam will be an enormous advantage to the fighting power of your ships; while I think, trusting much to your present system of sails for practical work, when you come to want it, is very likely to prove untrustworthy, and to lead you into difficulty, I would seriously suggest to you, while you improve your steam power to the utmost, not to run away from the sails without making a very great effort indeed to simplify all their arrangements as much as possible, to have as little impediment as possible from the plans that have been taken, and to enable you to utilize them, as a third resource, when necessary. Allow me to make one final remark, which I think is of great consequence to you in the practical use of your steam ships. I do not like twin-screws. I prefer one very much, but I recommend you to have all your steam ships with two screws, and for this reason only: when

one screw is disabled, I like to have another, therefore I recommend you to use what I do not approve, but what I think is entirely for your interest, and entirely consistent with prudence. The other point I would just allude to, for a moment, is this, that I think you may dismiss from your minds all concern about ballast, and things of that kind. I do not think anyone has any right to build a war steam ship that has anything to do with ballast, and I will give you a conclusive reason why you should not. I want the ballast in a useful shape, instead of in a useless shape, and when you have got on board your ship 500 tons of iron, in the shape of machinery and boilers, or perhaps 1,000 or 1,500 tons, what a goose you must be if you cannot put that in the place where it will serve all the purposes wanted for ballast and stability. A man who builds a ship for you, and fails to do that, knows nothing about his business.

Captain COLOMB: I think I have, in the first instance, to congratulate the Institution on the fact that every speaker has stuck to his point, and that the paper put before this Institution has been really discussed. It has been my unfortunate lot occasionally to read papers at this Institution which have not been, by any means, properly discussed. I am sorry to say, sometimes speakers so far forget themselves as not, for one single moment, to allude to the subject of the paper, but to ride—as we are all, of course, liable to do—off on their own little hobbies. I think, for the credit of the Institution, we might all try to keep the discussion as it has been kept to-night, strictly to the point. I have to thank Sir Spencer Robinson, and generally the speakers, for the very flattering way in which they have received the paper. Sir Spencer Robinson, in one way, is further in advance than I am; he would take away the sail-power entirely from a fleet-ship or ironclad; but so far as I understood him, Captain Tryon's old ship, the "Raleigh," more nearly meets his view of a cruising ship than the ideal I have attempted to put before the meeting. So far as the ironclad herself goes, I suspect it may be I have not got quite the pluck to go as far as Sir Spencer Robinson has. I must say I waver very much upon that point. So far as the other point goes, I must say I have taken the figures out as far as I could. The figures referred to have been, in the main, based on the table before you. But, as I reminded you, that table was drawn from twenty-eight primary tables, similar to Table I, which is entirely drawn from the ironclad spoken of; but there are still the remaining number of the forty-five tables, which are drawn in one case from a non-lifting twin-screw sloop, and in the other case from a lifting screw sloop. I quite agree with Sir Spencer Robinson, it is apparent, on the figures furnished from time to time by the Admiralty, that less displacement does not always increase speed; but still I think it may be taken in any ship of the Navy now afloat, the rule will be that, if you take some of her weight out of her, she will go faster. I think the great mass of steam trials of our ships on the measured mile shows, on an average, that they have run better at their light than their deep draught. But, of course, Sir Spencer Robinson's question is entirely bounded by the immersion of the screws, not actually by the displacement of the ship, and you might get immersion of the screws by great draught at the stern, without increasing the immersed area of midship section. Sir Spencer Robinson also spoke of the Pacific. Now, the Pacific is a trouble to me; it always has been a trouble. I own I do not quite see how to manage it at present, but when I come to think of the fact—which I believe, as far as I can make out, is quite certain—that, with the twin-screw under anything like decent sail-power, such as we could give her, say two feet per ton of displacement—with one of the screws only going, pretty close to wind, and moderate sail-power of this kind, you immediately double your mileage per ton, and, I think, in the Pacific the twin-screw, with fair coal supply and a fair amount of sail-power, would make those long passages more easily and quickly than with the present coal stowage and full rig. Sir Spencer spoke of the drag of the screw. I was bound to go to some ship which had not the drag of the screw, and I went to a ship with a lifting screw. Some twelve or fourteen tables, covering 10,000 miles, are taken from a ship which lifted her screw. It is quite certain your greatest gain with your sail-power is when you lift your screw and get the ship under sail alone. When you can do that, you get an enormous gain, and if you could have shown that there are figures extant to prove my figures here are overthrown by such a ship, then I must admit the fact. But in the ship I have examined, although she gained

by lifting her screw, she does not gain sufficiently to overstep the figures. She shows some 25 per cent. of gain. The Officer commanding her, although exceedingly fond of his sails, assured me that, if I had pursued my inquiries further, her percentage would have continually dropped, because she happened to go to places where her sail-power was not so available. Captain Tryon spoke of the slow speed. Well, I am as much against slow speed as he can be; but examining, as I have done, a great many of our ships, the slow speed is an absolute necessity for us. As we stand with our present coal consumption and stowage, the slow speed, when we want to get from point to point, is a thing which we cannot get over, and I think there is one point which we always forget. I tried to bring it forward in my essay; that is, that we start from certain fixed geographical facts. Except in the Pacific, it is a fact that there are no two coaling stations on British territory that are further apart than 3,300 miles. I think that is a thing that lies at the base of the whole of our shipbuilding policy. We have to recollect, if we have 3,300 miles of coal in our bunkers, we can always go from point to point with the certainty of a coal supply, provided we take care to keep the coal up. Admiral Hamilton was a little against me. I know quite well that, in reading a paper of this kind, I am in one sense throwing an apple of discord into the Navy. I hope it is a good apple of discord, and that we shall have many discussions, over it—and no doubt a great many fights—because out of these fights and discussions, truth comes forward at last. He spoke of the difficulty in which he would have found himself had he been deprived of his sail-power. Well, now you know I could not meet his remarks or answer them unless I had the facts relating to his ship. If I had the tables, such as I have there, of the whole of her commission, I should probably be able to answer the whole of his observations.

Admiral HAMILTON: I was alluding to the special case of being ashore, and having to throw the coal overboard.[1]

Captain COLOMB: That is quite fair; but still I could not answer your question unless I had the whole of the facts of the ship before me, which I have not. The difficulty is this. We are at present, in spite of ourselves, sending ships to sea, and the most valuable ships in the service, in the condition in which you would have found youself under my proposals. If the "Devastation" goes on shore to-morrow, where is she? And of course every other nation is doing the same thing. There are several ships in the Mediterranean without sail-power.

Admiral HAMILTON: I was referring to cruizing vessels: I give up the ironclads to a certain extent, not altogether.

Captain COLOMB: I think Admiral Hamilton drew attention to a previous command of mine, and asked how I should have got on without sail in her. When I commanded a previous ship, which was more capable of acting under sail than my last command, I certainly was not prepared to go as far as I now do; but at the same time doubts used to raise themselves in my mind. The ship I commanded, in order to establish her sail-power, had great draught of water. She was exceedingly lightly armed, and she gave up her armament and her draught of water, for the purpose of carrying her sails. A very much smaller ship would have carried the same armament on a very much less draught of water, and would, with a little increased coal supply, have done all the work we had to do. If there is a break-down of boilers and engines, of course there we are. That is the point. Every person who considers this question is bound to raise and think it out: and the way I have thought it out for myself is this: we have had steam and sail fighting a battle in our ships for thirty years. It is a battle in which steam has been constantly winning, and sails constantly losing. In all those thirty years, who can produce half-a-dozen cases where the sail-power really took the ship out of a danger or brought her safe home when the boilers and engines broke down? There are such cases no doubt, but on the other hand you get cases exactly the opposite way. The "Thetis" the other day—a full-rigged ship—got away from Port Saïd, jammed her screw, broke down in her engines, and you had the whole country in alarm about this full-rigged sailing ship.

[1] My debating powers were not quick enough to give the true answer to Admiral Hamilton, which is this: if he had had less masts and sails, he would have kept coal on board equivalent to the weight gained.—P. H. C.

They sent the "Devastation" out to pick her up, and she had to be brought in to Malta by a steam-ship without sail-power. A sister vessel to my former command stood across from Zanzibar to the coast of India and burnt the whole of her coal. She touched at a little port, the only one she could fetch in the south of India, and telegraphed up to the Commodore to say they were starving, their coal was out, their rum was out, their biscuit was out, everything was out. I received orders to go down and take this fully rigged sailing vessel in tow, and bring her to Bombay. I found her in a starving condition, and towed them the 300 miles to Bombay. If that ship had had a large coal supply I should not have had to go after her. The area of sail in mail steamers is another point which must occur to anybody putting forward a thesis such as I have put forward. I have made a good many inquiries about it. Coming home in a Peninsular and Oriental steamer the other day with some of the most intelligent men I have met, I had very long conversations with them. They told me the Peninsular and Oriental Company were quite at their wits' end as to whether sail is good or bad; that they make sail because they are bound to, but they do not in the least know whether it does them good or harm, and nobody ever made any calculations to ascertain which. It may be that they are good, but the facts nil, we have not got them. Admiral Ryder said he would like to have had some more rig in the "Audacious."

Admiral RYDER: Not in the "Audacious."

Captain COLOMB: In a particular ship which might be designed, and of course this brings out the whole question of stability. The ship in question had four square feet per ton displacement. You might, of course, by reducing your centre of effort, have got more sail upon her; but that is one of the questions in point. Admiral Selwyn has also made some observations. I think I should not have gone quite so far as he did as to speak of the ironclad in question, or her class, or in fact any of our ironclads, as "failures." I think it is a pity that strong expressions should be used. I think we should recognise the fact that we are in the midst of immense changes, and that not one of us knows whither they are leading us, and what is to become of us all. With compound engines, if Admiral Selwyn will produce us a ship which will steam thoroughly well and go 10 knots on the bowline, and 12 to 13 knots under sail, I am perfectly certain we should recognise her as a very perfect ship, provided she was not capable of being met at sea by a ship of the same displacement with heavier armament which would beat her. Admiral Selwyn also spoke of "Noah's arks." I am not prepared to admit that any of our ships are "Noah's arks." I think, having gone as an amateur into the figures, and made a very rash attempt at inquiring into the conditions of our ships, the conclusion I arrived at is very far from that of the gallant Admiral. They are, as a rule, the class of ship which every naval architect in Europe copies.

Admiral SELWYN: I spoke simply of the speed—the speed of a Noah's ark.

Captain COLOMB: The speed is practically the same. If you have to do the same work, the whole of the navies of Europe are in precisely the same condition, and I am not prepared to say that human brains are able to go further than they have shown themselves capable of doing in the designs of our ironclads at the present time. Admiral Selwyn also brought up the whole question of stability and rolling. A great many people think that I am one of those who imagine that this rise in the centre of gravity which has taken place at present, is a thing which I deprecate. The question before the naval architect is this: "I want a "steady gun platform," says the Naval Officer. Says the architect, "I cannot "at present give you that, unless I bring your centre of gravity up—unless I make "your initial stability small. I do not make your *stability* small, because the arm "of my lever extends very rapidly as the ship heels over, but I cannot give you a "steady gun platform unless I make my initial stability small." The only question is how small may he make that with safety. When you find fault with ballasting this ship you must recollect she was in some degree an experiment, and all you can say when you have said all that can be said, is that "they cut it a little too fine;" but the gallant Officer is, I think, wrong in supposing the ship would be unstable without ballast if the masts were taken out of her. I must quote one or two figures to show how mistaken those are who speak as Admiral Selwyn has done. "Fore and main yards weigh, in round numbers, 9 tons, and are 70 feet above the

"present centre of gravity. Their moment is thus 630 foot tons. The topsail yards "weigh 3 tons, and when hoisted are 122 feet above the centre of gravity. Their "joint moment is thus 366 foot tons, or for both lower and topsail yards 996 foot "tons." This is the equivalent of 50 tons of ballast.

Admiral SELWYN: You are talking of dynamics; I call them statics.

Captain COLOMB: There is the whole point. Mr. Scott Russell was kind enough to agree with me on general points. He objects to the twin-screw for certain reasons, but upon the whole he thinks its merits for other sufficient reasons outweigh its demerits. I can only say, in conclusion, I am very much obliged to the meeting for the kind way in which they have received my paper.

The CHAIRMAN: At this hour I need not detain the meeting by any words of my own. I think we have to thank Captain Colomb for the great pains he has taken, not only in the lecture he has put before us, but also in his reply, which really almost comes to a second lecture. I therefore offer him on the part of the meeting our double thanks. It must have been an extremely interesting evening, especially to Naval Officers, and I hope we shall have many such discussions.

Evening Meeting.

Monday, February 11th, 1878.

LIEUTENANT-GENERAL SIR GARNET J. WOLSELEY, K.C.B., G.C.M.G., &c., &c., in the Chair.

ON THE BEST DETAIL FORMATIONS FOR INFANTRY ATTACK.

By Lieut.-Colonel J. H. A. MACDONALD, Queen's City of Edinburgh Rifle Volunteer Brigade.

HAVING been more than once urged by military men, well versed in their profession, to prepare a paper for this Institution, which might be the means of evoking discussion on infantry tactics, in the present transition state of that branch of military science, I have undertaken to do so with some misgiving, for I cannot but feel that one who knows nothing of active military service, must appear as Fitz-James did to Roderick Dhu, a mere carpet knight, to those who have seen the tactics taught on parade, practically tested in the field. But I am encouraged by the kind and generous reception accorded to me by the profession, when I ventured before to write on a military subject, to hope that those friends who bade me come before you may not fall under your censure.

Modern weapons have made change in tactics an absolute necessity. While it was possible to come to close quarters, before either belligerent could inflict serious loss upon the other, close formations were permissible, and roundabout modes of movement might not be fraught with much danger. Large bodies could be moved directly by the word of command of one Officer, the mode in which the order was to be obeyed being inflexible, and the subordinate Officers having no other responsibility than that of seeing the command carried out with an exactitude as nearly mathematical as possible. On an order being given, the consequent words of command by the subordinate Officers were fixed and unvarying. The change to be effected was so precise, and the mode of carrying it out so strictly confined to movements in exact lines, and wheels on pivots, that its detail could be laid down absolutely on a

diagram. The battalion was thus practically the smallest tactical unit, falling into wings or divisions only in order to facilitate transition from one position to another, reconsolidation in one compact body in a new position, whether in line or column, being the immediate purpose of every movement. When the battalion was divided, the segments were jealously kept in one order, so that, on reconsolidation, the sequence of its parts should be exactly the same as before. From the moment of its formation on parade, it had a front nailed on to one side of it, by Her Majesty's orders, so that its commander was the slave of that front, and could not handle his battalion as he pleased, to suit the position in which he found himself. A regiment which happened to leave its private parade in what was called "right in front" might be able at once to take up its position in brigade, while another, arriving in what was called "left in front," might be unable to take its place till it had been put through a manœuvre as lengthy as and more complicated than a figure of a quadrille. In short, rigidity, as contra-distinguished from flexibility, was the most marked characteristic of infantry tactics. And this, not only in our own country, but throughout the whole continent of Europe.

But within the last ten or twelve years, a great many of these features of complication and rigidity have been removed from the Field Exercise. The system of artificial fronts was most vigorously attacked, not only by amateurs like myself, but by professional soldiers, notably by one who has done much service in the field, Colonel Sir Lumley Graham, late of the 18th Royal Irish, whose denunciation of them as "arbitrary" is most just and pithy. And the result is, that now the parts of a battalion are moved so as to bring it as quickly and efficiently as possible into new positions, without regard to what company may come to stand in front, rear, right, or left. The Commanding Officer has no longer a double duty to perform, one, to bring his battalion into a position ordered, and the other, to keep his companies always in a fixed sequence. Time is not wasted in elaborate wheels, and a general tendency is evinced to go the shortest way from point to point. It may give some idea of the extent of change that has taken place in military opinion, to quote one passage from the Field Exercise and Evolutions of Infantry for the year 1833, viz., "The formation of "four-deep, *though deemed inapplicable to battalion drill with reference* "*to service*, may, nevertheless, in certain cases, be applied," &c. How strangely this reads in the light of the changes made since that time. It may now safely be said that, although some movements are still retained which are performed by wheels, these are never made use of on service. When troops are out manœuvring, on a large scale, on ground not as flat as a barrack-yard, as on Salisbury Plain or Dartmoor, the convenient formation of fours is that which commends itself to everyone as the most applicable in almost all circumstances. Troops can be moved round obstacles, or led through gaps in fences, and the new formation be more rapidly reached, and as steadily completed, as under the old system.

But now that all this has been done, a new difficulty has arisen. The formations themselves are being found to require modification.

The column has lost its place in attack for ever, as no troops can live in it, under modern fire. And, although a line formation is still, and wisely, looked upon as the most efficient mode of finally forcing an enemy's position, it is on all hands admitted that troops cannot traverse in any solid formation whatever, the many hundreds of yards beyond the range of close quarters now covered by even small-arm fire. Means must, therefore, be found for pushing forward, bit by bit, the force which it is ultimately intended to concentrate in a line for the final effort, so as to enable the consolidation to be made without such losses beforehand as would practically shatter the force, reducing it to the condition of a weapon liable to break from sheer weakness in the attempt to make it strike with crushing effect. This is the practical problem to be solved in infantry tactics. If I may use homely language, I would describe it thus: How best to dribble in detail over the ground covered by long-range fire so as to retain sufficient strength and connectedness to be able to tighten together effectively, for the final blow which shall decide the day.

It can scarcely be said that any nation has as yet satisfactorily worked out a mode of detail for effecting this object; but there is more than one that has adopted a tentative system, and is elaborating it from day to day. It may suffice to refer to the Prussian and our own as illustrations of some of the principles aimed at, and the modes by which it is attempted to follow these out.

The Prussians have adopted as a fundamental principle that when the force which is to be pushed forward by sending a part out first, pressing forward other parts as may be required to solidify it and concentrate attack at close quarters, the process should be so regulated as to restore each unit to its integrity, and not mix the units together. And having adopted the company as the "sub-unit for battle," they work it in a company column, sending out a part of and then the whole of the first section, treating the next section as a support and the remainder as a reserve, all under the direct control of the company Officer, who can order up reinforcements as he sees fit. So strictly do they adhere to the principle of endeavouring to secure tactical restoration of the unit in its perfect form, that it is laid down in their system that the sections of the company forming its supports or reserve shall not, when brought up to the fighting line, be interspersed between the extended files already in front, but shall fill up intervals left, those already in front closing in to make room for them.

Our system is quite the opposite of this. The tactical unit is kept large, and support is not in the discretion of the company Officer. He must trust to his need of it being seen by another, and must hold out as he best can till it is sent to him. Whole companies are moved to the front at once, and concentration is obtained by extending and advancing other companies, their files getting in between those of the company in front. Orders for reinforcement are never given by the Officer in command of the company who is in the fighting line, but always by a field Officer. The result is that the whole line is reinforced at every point, but the companies are mixed up together indiscriminately. Thus the very thing which the Prussians so anxiously guard against

is a leading feature of our system. They sacrifice the advantages of reinforcement and a fresh supply of ammunition at every point of their fighting line in order to obtain tactical reconstruction; we obtain complete reinforcement at the expense of a total abandonment of consistency of tactical form. It is therefore plain that where the modes adopted for attack by two nations differ so fundamentally, there must be something that is faulty in one at least of them, and possibly that both may be open to serious objection. I am inclined to think that a critical examination for the purpose of arriving at a decision as to the things to be aimed at in framing infantry tactics to suit modern fire range, will demonstrate that in both the systems referred to faulty modes have been adopted for carrying out sound principles.

The first proposition I would lay down is, that *as the force which formerly went forward compactly must now be broken up into parts and again solidified, a mode should be devised, if that be possible, which shall make reconsolidation be the same thing as reconstruction.* That is to say, given a force that must disintegrate into thinner parts, and re-form a line again after ground has been crossed by the attenuated portions, a mode which would reproduce it as nearly as possible in the tactical form it held at first, would be preferable to a mode which merely formed a similar line, but in which the individual soldiers belonging to different units of command were interspersed together. I think no one can doubt that just as both horse and rider do best when they understand one another's ways, so Officers and men who know each other well are more to be relied on to do their work efficiently than when commander and men have little knowledge of one another. And it follows from this, as a necessary axiom, that the immediate command over men should be changed as little as possible during the course of an engagement. Casualties will occur, but this only removes the command from one known Officer to another, whereas the intermingling of companies necessitates command being transferred to comparatively strange hands, according to the accidents of seniority. This is not only objectionable as being a change, but may often result in men being ignorant at the most critical point of an engagement from whom their orders are to come, than which nothing can be imagined more likely to cause wavering or to convert check into disaster.

The next proposition, being an amplification of the first, is, *that the mode adopted for making reconsolidation spontaneously produce tactical reconstruction should, if possible, effect that result not only when reconsolidation is caused by the main body pushing forward to concentrate the attack, but also, and much more, when reconsolidation results from part of the force first sent forward being ordered or compelled to fall back towards the main body.* I speak subject to correction, but with some confidence, when I say that this is perhaps the most important point of view from which those on the outlook for a good mode of attack should make their observations. If a system can be devised which, from its nature, tends to prevent check from becoming disaster, a temporary disaster from becoming a rout, that system will be preferable to one formed on the assumption that as checks and disasters are

to be avoided, their possibility should be ignored. Tactics which are framed only for victory, and with no regard to preventing repulse from becoming destruction, are essentially faulty. Therefore if the first proposition—that reconsolidation should, as far as possible, be reconstruction of tactical units in pushing forward to success—is sound, it is manifest that the same rule must be in a higher degree applicable to the case of troops compelled to retire. If in falling back they were returning to their places in the tactical unit from which they had been pushed out, rallying and recovery would be made more likely, or if this were not possible, an orderly and on that account less hasty and disastrous retreat might reasonably be hoped for. It is in this particular that there appears to be most faultiness in both our own system and the Prussian. Under our mode of attack, a check and retrograde movement may mean the retirement of several units, mixed up in complete disorder, uncertain who is their commander, and with no tactical form, and therefore no integral cohesion. This is in itself demoralising. A state of things in which it is possible after ground has been lost, that each of two tactical units which were mixed up together, may be able to blame the other for giving way first, without the possibility of the superior Officer ascertaining whether one or the other, or both, were in fault, ought surely to be avoided if possible. But, apart from this, is it not plain that every unnecessary and avoidable disarrangement of units in an advance will have its counterpart in unnecessary but unavoidable disorganization in retreat, if retreat does take place, whether through fault or of necessity? The Prussian system, on the other hand, is based on the idea of reconsolidation taking place by the sections in the fighting line and the other sections being brought end to end, the original attenuated fighting line closing to make room for the parts by which it is to be consolidated, and these, to use the words of their own book, being pushed into the intervals. It is difficult to believe that this mode could ever work satisfactorily, particularly in retreat, and some of their own best authorities condemn it as impracticable. Major-General Newdigate, in his paper on the Prussian drill of 1876, quotes a paragraph which, as he says, indicates the weak point of the new dispersed order of fighting, as adopted by the Prussians, to be the risk of retiring movements degenerating into confusion. The paragraph is as follows:

"It must be rigidly enforced that retiring movements immediately "after an attack are always carried out in step (not at the double), "and that on these occasions taut hold of the men is never lost."

This just means that a dread lest under this system retirement should not result in reconsolidation and accumulation of power, but should lead to confusion and disaster, compels them to expose men forced to retire to more loss from the enemy's fire than they were liable to when advancing. As General Newdigate truly says, "This "short paragraph speaks with an eloquence which cannot be over-"rated; for it touches the weak point in the dispersed order of fight-"ing," by which I take him to mean that in the systems adopted up to the present time, it is felt that the retreat is worse provided for from a tactical point of view than the advance, whereas, if it were

possible, the very opposite should be the case. There are no circumstances in which tactical cohesion and concentration are so vital as when a fighting line is being pressed back, and it is demonstrable that they are not the natural sequence of retirement of the fighting line, either on the Prussian system or on our own. The weakest point is found where weakness is most to be guarded against. Of course I am not to be understood as suggesting that any system that could be devised would make it unnecessary to use means to prevent hurry, and to keep taut hold of the men in retiring movements. All I am endeavouring to establish is that it is true that in retiring there is the greatest risk of men getting out of hand, and into a state of unsteadiness, which may become irremediable. This is in itself one of the most cogent reasons for endeavouring to obtain a system, the nature of which shall be such as spontaneously to produce a refitting together of the tactical unit, part of which has been sent forward to engage the enemy, when that part is made to fall back, either because of orders issued by an Officer in superior command for special reasons, or in consequence of the advanced position being for the time untenable.

The last general proposition is, *that the captain of a company being in immediate charge of the men in the fighting line, should have no greater extent of front than will admit of personal superintendence and close control over the men and that those who form the supporting body behind him should be at his command as he may require their assistance.*

The two points of this proposition involve a complete departure from our system, in which a whole company is dispersed in front, and the supporting body is moved by order from behind, issued by an Officer who has several companies to look after. The Prussians, on the other hand, strongly insist on both parts of the proposition as fundamental rules. With them the company is the unit for battle, the company commander having a certain amount of independence of action, and it is specially laid down that "the skirmishers are always sup-"ported by the companies to which they belong."

This propositon is insisted on for the following reasons:—

1st. A whole company extended, particularly in the present day, when broken ground and cover are sought for, is likely often to get out of hand. I appeal on this matter to the experience of those who saw the autumn manœuvres on Salisbury Plain, a country selected as being the most open and free from obstructions in England. How often, from the units in the front being too much spread out, did confusion and uncertainty result, corps losing their cohesion and getting helplessly mixed up with others.

2nd. The attempt of a captain to look efficiently after so long a front in broken ground would soon cause bodily exhaustion, weakening his efficiency in every respect. I believe this was the experience of the Kaffir War, where captains suffered terribly from over-exertion in the endeavour to look after their men, often being unable to do it at all.

3rd. Temporary support can be most efficiently used in circumstances which do not call for a reinforcement of the whole line. For example, a small part of the line having to advance down an exposed slope, might be efficiently helped by its own support being pushed up

to the back of the slope, and firing over it. Many other illustrations may at once occur to the mind when our own undulating country with its belts of trees, brushwood, dells, and strong hedgerows are called to mind.

4th. A temporary difficulty occurring at one point of the line can be more quickly and efficiently dealt with. This is too clear to require illustration, except to say in one word that to leave the supply of support entirely in the hands of a mounted Officer, who often may have to go a long distance round about to get forward at all, and who very often cannot by possibility have half his command within sight, appears to be out of the question, now that skirmishing is no longer a mere preliminary to battle, but is an integral part of the main battle itself.

5th. The moral effect of those immediately behind the men in the fighting line being part of the same unit with themselves, their daily companions in duty, and ready to come to their help at the order of their own Officer, would be most beneficial, both in filling the attack with vigour, and preventing a check leading to demoralization. There is an *esprit* of the company, as valuable in its degree as *esprit de corps*, which the new mode of fighting in dispersed order makes it most desirable to foster. If the company is to be a practical tactical unit, then it should be, to use a common phrase, as self-supporting a body as possible.

The points which have now been stated, in such detail as the time at my disposal permits of, as being important to be aimed at in framing a system of infantry tactics, may be summarised thus:—

Consolidation from dispersed order, whether in advancing or retiring movements, to be so effected as to tend to produce tactical reconstruction of units.

The company commander to have his portion of the fighting line so limited as to admit of direct personal superintendence even on broken ground.

The supports and main body in rear of the fighting line to be of the same tactical unit (that is of the same company) as the portion of the fighting line in front of them; the support to be primarily at the disposal of the company commander, as he may require assistance during the advance. The force has thus for its detail work a unity of command in depth from front to rear, without infringing upon the unity of superior command both in length and depth.

Now, in searching for a suitable mode of carrying out these principles, it seems natural to turn back from the subject of advance to attack, and to direct attention to the ordinary parade and marching movements which are used to bring troops into position for active duty. Because it is evident that, if a mode of arrangement already known to be suitable for these purposes, should also be found to supply the means of carrying out the attack in accordance with the principles laid down, a great advantage will be gained, as your system of tactics will be consistent with itself. The advance to attack need not be a departure from, but only a spreading out of, the normal formation; and the bringing up of a main body for the final effort will be but a recontraction into the solidity of the original in its

actual form—not a thing made up like it, but really composed of fragments whose relation to one another is new, accidental, and confused.

Turning, then, back to parade formations, the first that strikes one as being the most convenient for all general purposes, is that of four-deep. It is this formation which is found most suitable for practical work, whenever the level parade has to be left for ordinary ground. It embraces the three elements of simplicity, celerity, and convenience. It is the formation which best fulfils Sir Lumley Graham's desideratum, "total absence of constraint in the position of the soldier, "both when halted and on the march, so that he may be able to use "his arms and legs to the best advantage;" to which I would add, and in which he can move with least fatigue—all most important matters, when it is considered that fretting trifles tending to physical exhaustion may not only end in destroying bodily activity, but also may seriously affect *morale* in subordinates, mental activity in superiors, and may I not add, temper in all?

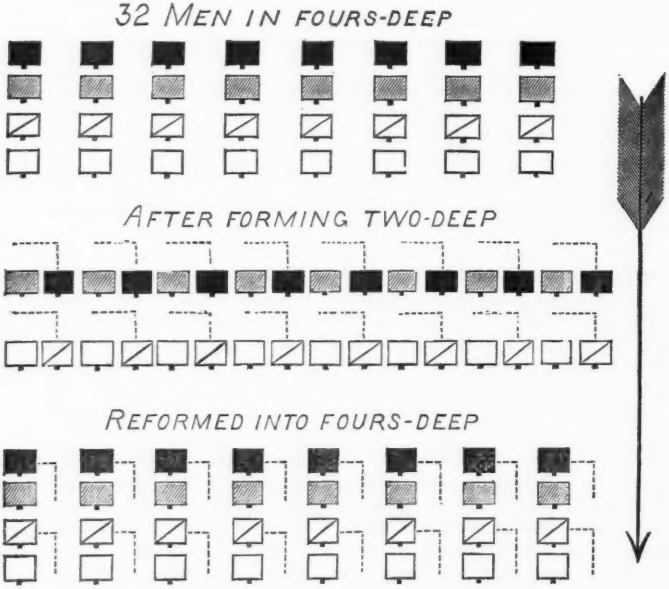
Fours being, then, the best general formation for all ordinary purposes, it is obvious that if infantry can be sent out to attack from that formation in such a manner as to fulfil the requirements which have been already insisted on, the whole system of infantry tactics will be simplified and made to have one formation for its basis. It shall now be my endeavour to show that this can be done, and done with advantage in every respect.

Let it be supposed that a line is standing on parade, not in two ranks, dressing by touch, but as it would be under the present system after the order "Fours-deep" had been given; that is to say, it would be standing in four ranks, with about arm's length intervals between the men. As regards ordinary movements, the whole would retain the same formation whether they were moved forward or back, right or left, having merely to turn in the direction ordered. Every man would be perfectly free from constraint in his movements, able to swing his arm, as the Prussians most properly make him do, and would have free circulation of air round him, in whatever direction he moved, small obstructions could be passed without throwing the line out, all counter-marching, all forming to front or rear, to the right and right-about, or left and left-about, would be rendered unnecessary, and there would be no difference as there is now in the mode of formation of fours, whether deep, right, left, or about. The front of a column could be reduced to one-half without any change of formation: column wheels would be much easier, and squares could be formed either four deep or two deep without a different division of the companies. The battalion would be in every way more flexible without there being any tendency to relaxation of strict drill, which is so essential to maintain steadiness and discipline. In a word, the system would be less cumbrous and more what tactics devised for actual use ought to be, as distinguished from tactics which are framed as if troops always moved on ground artificially levelled. To use the words of Major von Scherff, a distinguished German writer on tactics, we can "dispense with a number of close

"order formations, which are still much used, and which waste a "great deal of time."

By this arrangement, the fours, if required for a temporary purpose to form two deep, could do so indifferently as to front, without the

FIG. 1.



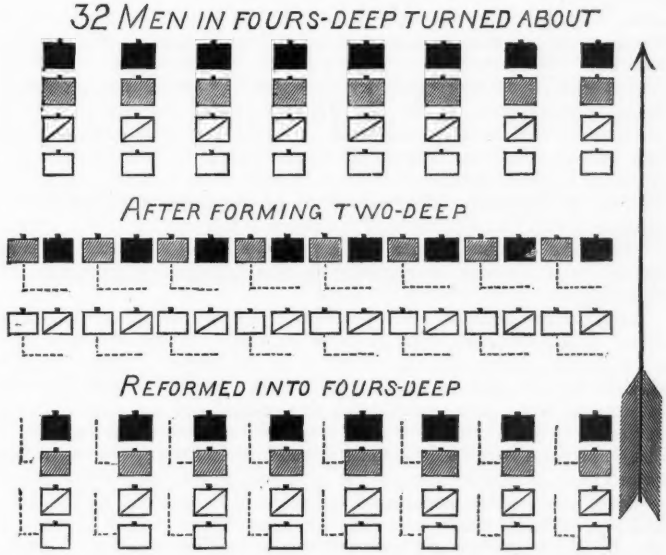
slightest risk of mistake, by following one simple formula, viz: to form two deep the second and fourth men of each four would step to the left and up, and to get back into four deep, the man on the left would step back and to the right. And as the men of each group of four would be convertible units of that group, no confusion could arise. The accompanying diagram shows that the men will, by following this one simple formula, stand always in the same position to one another, whichever way they are turned. Fig. 1 represents the men facing the reader, figure 2 represents them turned about.

It only remains then to examine whether this formation, which recommends itself by its capacity for husbanding physical energy, promoting rapidity of movement, and increasing flexibility in changes of position, can be usefully applied to carry out the principles necessary to be observed in actual engagement with the enemy.

For this purpose it will be most convenient to take a single battalion for illustration. After detailing off from the battalion whatever proportion is necessary for a general reserve, let it be supposed that it

is drawn up in line, in "fours-deep." The best shooting men might be brought to the front, and any men brought into the company in equalising kept in rear. On the order to advance for attack being given, the first rank of fours would be marched off, the captain of each company going with it. In a company of 100 men, each captain would have twenty-five men out in front at one pace interval. Marksmen might be thrown out in front from this rank when ad-

FIG. 2.



visable. The next rank of fours would follow as support, under subaltern officers, two or more intelligent non-commissioned officers going out as links in front, to guide the support correctly in rear of its own part of the fighting line, and to convey any orders from the captains which might be sent back to them. The remaining two ranks of fours forming the main body would follow, their connectedness with the support being kept up in a similar manner.

The units of frontage being moderate in size could thus be most efficiently handled, confusion and loss of connectedness prevented, support brought up for any temporary purpose for which it might be required, a thing of great importance, and specially in a much enclosed country like ours. The whole line could be kept firm hold of, the fire carefully controlled, injudicious and hasty advance restrained, and wavering or giving way checked. Every movement, whether of pushing forward reinforcement, or falling back on support, would tend to

reproduce in its regular form the tactical unit originally subdivided for the attack. The main body would fulfil von Scherff's requirement, as to which every one will agree with him that "in order to give the "necessary impetus to the attack, it will be undoubtedly advisable "that our main body should at least equal in strength the total of the "two front lines." The arrangement will get rid of what he admits to be an evil, but sees no remedy for, the doubling up of section with section and company with company in a confused mass. Each company would, as such, remain under the same direct command from first to last, and the attack when concentrated by the bringing up of the main body, would be not only in form, but in actual fact, an attack of the line, precisely similar to that in use before the days of rifled breech-loaders. This system has moreover two special advantages. The one is that while it is thoroughly well adapted for use in open ground, it is also admirably suited for the very broken and intersected ground we have in this country, and would prevent the great confusion and loss of connectedness that so often resulted from this cause at our Autumn Manœuvres on ground much more open than is generally to be found in England. The other is of an importance that cannot be overrated, viz., that the mode of procedure is the same in every respect, whether the number of men to be moved is small or great. It is as applicable to a squad or company as to a battalion or a brigade, the procedure in all cases being the same.

Such are the main grounds on which it has appeared to me, and to others whose opinions, being those of men of professional experience, have intrinsic value, that the adoption of the four-deep formation as a tactical basis would be an advisable step. It would conduce to the attainment of the three great desiderata—simplicity, celerity, and convenience—while at the same time it would assist the maintenance of disciplined and regulated movement, and husband strength to a greater extent than any other system yet proposed, giving the best hope of physical power being maintained to the decisive moment, and thus indirectly, yet most really, securing the best chance to both Officer and men of being able to work with full vigour and rapid action of the intelligence without which much of the value of bodily energy and skilled training is necessarily lost. And last, but not least, it would make the dominant principle of advance and retirement the same, reconstruction being the natural sequence of either, thus preventing confusion of units in the order-obeying part of the force, and confusion of command in the order-conveying. These are advantages which might outweigh defects in other respects, but if they are found applicable to a system that is in itself unobjectionable, must necessarily turn the scale completely in its favour. Whether they are applicable or not, is a question which I leave with confidence in the hands of those whose professional skill enables them to give their opinion with authority.

Appendix.

As a guide to any Officer who will do me the favour to give the system a practical

trial, the general details necessary for the drill of a battalion or brigade are added.[1] I hope that whoever superintends the practice of this drill will keep constantly present to his mind the purpose it is intended to effect.

Troops when required to advance in order of attack have nothing whatever to do with scouting or searching for an enemy, protecting their own flank, or outflanking, or threatening to outflank him. Before an attack of the kind, for which I have endeavoured to suggest a suitable method, is commenced, it is to be understood not only that the position occupied by the enemy is known, but that the troops defending it have, for a considerable time, been exposed to a heavy fire of artillery, and possibly that attempt has already been made to carry the position by the advance of infantry. It is also to be understood that besides the troops to be employed in the direct attack, a separate body has been told off for the protection of flanks, or for operating against the flank of the enemy. Thus, the duty of the Officer in command of the troops told off for the direct attack is restricted to effect a single operation, that of advancing the troops under his command as rapidly as possible directly to their front, over from 2,000 to 1,000 yards of ground exposed to the enemy's fire, with the least possible loss, and the greatest possible power of finally concentrating for the charge, a line of soldiers formed in close file. Let it be supposed that the troops have been deployed in a four deep line and told off in groups of eight, which may be done by telling off the groups of four into "first, second"—"first, second."

At the caution of the General Officer in command "THE LINE WILL ADVANCE IN "ORDER OF ATTACK," followed by signal to move, the Commanders of battalions will give the word "*No.* 1 *ranks—quick march!*" At this word these ranks will step off together in quick time, the "second" of each group of eight inclining to the right so as to come close alongside their "first."[2] When these men have gained from 150 to 200 paces, battalion Commanders will give the word "*No.* 2 *ranks—quick* "*march!*" when it will move off in the same manner.

No. 3 and 4 ranks, whenever the nature of the ground makes it advisable for the main body to move, will receive the command from the senior Major "*No.* 3 *and* 4 "*ranks—quick march!*"

In advancing in this formation No. 1 rank will be led by the Captain, assisted by the junior subaltern and two sergeants; No. 2 rank by the senior subaltern, assisted by two sergeants; and No. 3 and 4 ranks by the second senior subalterns and remaining sergeants or lance-sergeants.

The post of the Officers and non-commissioned officers of No. 1 rank will be in rear. The leaders of No. 2 and of No. 3 and 4 ranks will be in front, and the non-commissioned officers attached to these ranks will be in rear of the flanks.

The Captain will be attended by two corporals, who will be used as connecting links to communicate with the supporting ranks and main body.

The post of the Lieutenant-Colonel will be 30 paces in rear of the centre of the line of supporting ranks. He will be accompanied by the junior Major, the Adjutant, and three corporals.[3] The junior Major and Adjutant will act as *aides* in communicating with the leading ranks, and in passing orders along the fighting line and line of supports. The corporals will act as links to communicate with the reserve ranks No. 3 and 4. The post of the senior Major will be 20 paces in front of the line of the reserve ranks (3 and 4). He will be accompanied by the sergeant-major.

In all cases of reinforcement, the link corporals should meet the flanks of the reinforcing rank or ranks in rear of the fighting line, the non-commissioned officers on the flanks of the reinforcing ranks going out in front to lead them up correctly to the position marked by the link corporals. The men should be carefully trained in rapidly finding their own group.

Captains should be instructed to bring up their own second rank temporarily, where the nature of the ground may make it advantageous or advisable.

The above may suffice for a trial of the system, the advance under musketry fire,

[1] Added since the paper was read.—ED.

[2] Some may think it better to put them behind in file, but I am inclined to think that to put them close alongside one another is the best arrangement for securing *intelligent* work or mutual help.

[3] On service, grooms for the horses would be necessary.

reinforcing, charge, &c., being conducted generally on the principles laid down in the "Field Exercise."

Colonel FLETCHER, Commanding 2nd Battalion Scots Guards: Before discussing the questions involved in the paper we have just heard read, I may perhaps be allowed to say how much we of the Regular Army are indebted to Colonel Macdonald for bringing his valuable opinion to bear upon this important subject. Very often extra-professional criticism is most valuable; it spurs on the profession to fresh study, and it also brings minds that are possibly not to a certain degree narrowed by looking at the subject from one point of view, to bear upon the matter in question. If therefore I at all criticise what Colonel Macdonald has said, I do it with the utmost diffidence.

In the first place I think a portion of that great stiffness which Colonel Macdonald alluded to, and which characterised our drill a very short time ago, was not so much in consequence of tactics arising from the weapons we then used, as in consequence of the long period of peace. I remember perfectly well about seven years ago meeting the late Field Marshal Lord Tweeddale; he was talking about the reforms then being made in the Army, and after having discussed them he said: "There is "nothing new in them to me; these are the very things I learned under Sir John "Moore." The truth is, after a long peace, we get into certain fixed habits, and forget that the dry bones of tactics have to be infused with the real spirit of service, in order to make them of any real value.

I think there is also a certain danger (much as I value the Prussian books that have been written), of our getting too much into a German system, for however applicable a German system may be to Germans, and however applicable a French system may be to the French, I think we as English are bound to have a system of our own which will suit our troops, will suit our organization, and will suit our discipline. With reference to the system of attack which is now promulgated in the Field Exercise Book, I would venture to say that it has been a little hardly dealt with by Colonel Macdonald. There is greater elasticity allowed in the Field Exercise Book than has been allowed in the lecture. If I remember rightly, not only may a company be sent forward, but it is also perfectly allowable to send forward a section and to reinforce that section successively by others. I think also it will be found that not only may the supports be ordered up by the Field Officer, but they may be also ordered up by the Captain commanding the supports. I speak from recollection without having referred very recently to the book. The truth is that the new order of attack has apparently been somewhat of a compromise, and seems to contain certain contradictions. I am rather glad for one that there are contradictions, because it allows greater latitude in carrying it out. When your men are in extended order, you must rely upon previous teaching and discipline, and upon what the Germans call "fire discipline." You must have educated your battalion so that when once *lancé* to the attack it may to a certain degree be able to act without the supervision of the Colonel. You must have taught your Officers according to their grades and also your non-commissioned officers, and you must have instructed them so far as possible individually, so that they may take command, and be prepared to act as occasions may present themselves without the direct supervision of the senior Officers.

With reference to the four-deep formation, I think I may compliment Colonel Macdonald on having attacked the present formation of fours which very few regular Officers would have done. We have got the present system so imbued into our minds that we never think of forming fours differently than according to the present method, and Colonel Macdonald has put before us another way of doing it which appears at first sight simpler and better. But with regard to using the four-deep formation as the means of open order attack, I think there is this difficulty. As long as you are acting on a smooth surface, or where everything is perfectly regular, and where the different units fit into their proper places, all goes well; but suppose as you are marching forward to the attack, with your front line of fours, you see a position on your right or left which it is necessary to seize (and this will be often found to take place not only in action but also

on field days over rough ground where you have a supposed enemy in front of you), the Officer using his own discretion moves the support to right or left; immediately the whole system of attack is upset, and confusion becomes worse confounded. Doubtless under the present system there must be confusion: and what you must do is to educate your Officers and non-commissioned officers to act in confusion. You must imitate confusion continually, and you must teach them the habit of commanding men in front of them although these men may be intermingled and of different companies. I think this is the criticism I will venture to make upon the four-deep formation. With regard to the retirement after an attack, you must depend upon having a certain portion of your force well in hand to cover retreat, as I think it is almost impossible to rely upon a beaten force falling back upon the several four-deep formations as shown in the diagram. But supposing this formation were carried out, it would require also a different system of disciplining your company. If your men are to act in four lines in the way indicated, you must divide your company up into four similar sections, so that each of your sections shall be commanded properly according to their formation, and not as at present when standing in line; for nothing can be more important than that your section should be properly and intelligently commanded by their own sectional leaders; and also it is of immense importance that the men who stand together, should act and work together both in field and camp. Therefore, to carry out the four-deep system a new disciplinary formation as well as a new tactical formation would be required. I do not say this as an argument against the system, but point it out as a corollary that should necessarily ensue from its adoption.

Lieutenant-Colonel BLUNDELL, Grenadier Guards: Gentlemen, we must all, I think, agree with Colonel Macdonald in his aim of attempting reconstruction when the line is formed for the final rush, if it is possible, but I for one doubt its being possible. I have had a good deal of practice in skirmishing companies, not in the field but on parade, and I must say I think it quite uncertain if you divide a company (when several companies are acting in line together in extended order), I consider it quite uncertain, if you divide a company and let one-half company support the other half, whether, when you want to reinforce the half company in front, its own half company will reinforce it: you find there is a certain drifting of the line, there is smoke and confusion, and my belief is, if a Captain of a company wants to command his company properly, he should be in the rear of the centre, and that the whole company, not too long, should be in one single line. He has then perfect control, no matter how long it is, he passes orders along the rear, whereas if he has to be hopping between the half company in the front line and the other half company, perhaps a couple of hundred yards behind, the chances are he will lose one, perhaps both. I think we should be very careful about the use of terms. A great deal has been said about the Prussian "company." Now, I contend that there is no doubt the Prussians gained a great advantage by the use of that large company of 250 men, but it was not because it was a "company," but in spite of its being a "company." It acted as a battalion, and they gained their advantages by using small battalions. Their companies became, in fact, small battalions. It has always been considered in the British service that a company of 32 files is about the handiest body you can use, and you find that four "companies," of 32 files, will not differ much from the strength of the Prussian "company"; that is to say, one British half battalion, of four companies each of 32 files. It is as perfect a unit as you could possibly have to use in the field; and if you identified the Major with his half battalion in practice as much as he is in theory, you would at once have what you may term a Prussian "company" if you like the word, but better organized, and, in reality, a battalion composed of four integers, each under, suppose we term them, Commanders, and we similarly styled the Sub-Lieutenants, Lieutenants. I believe that would be the very best arrangement, and I think with our attack formation you would at once arrive at that, if in distributing the companies at first you so arranged it that when your battalion was all thrown out, the reserves reinforcing the fighting line, you had your right half battalion on your right and your left on your left. To this extent I believe reconstruction is possible; the book permits it but it does not suggest it as the normal formation. Then there is another point I should like to mention. Even before the Crimean War, it was a

reinforcing, charge, &c., being conducted generally on the principles laid down in the "Field Exercise."

Colonel FLETCHER, Commanding 2nd Battalion Scots Guards: Before discussing the questions involved in the paper we have just heard read, I may perhaps be allowed to say how much we of the Regular Army are indebted to Colonel Macdonald for bringing his valuable opinion to bear upon this important subject. Very often extra-professional criticism is most valuable; it spurs on the profession to fresh study, and it also brings minds that are possibly not to a certain degree narrowed by looking at the subject from one point of view, to bear upon the matter in question. If therefore I at all criticise what Colonel Macdonald has said, I do it with the utmost diffidence.

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I think there is also a certain danger (much as I value the Prussian books that have been written), of our getting too much into a German system, for however applicable a German system may be to Germans, and however applicable a French system may be to the French, I think we as English are bound to have a system of our own which will suit our troops, will suit our organization, and will suit our discipline. With reference to the system of attack which is now promulgated in the Field Exercise Book, I would venture to say that it has been a little hardly dealt with by Colonel Macdonald. There is greater elasticity allowed in the Field Exercise Book than has been allowed in the lecture. If I remember rightly, not only may a company be sent forward, but it is also perfectly allowable to send forward a section and to reinforce that section successively by others. I think also it will be found that not only may the supports be ordered up by the Field Officer, but they may be also ordered up by the Captain commanding the supports. I speak from recollection without having referred very recently to the book. The truth is that the new order of attack has apparently been somewhat of a compromise, and seems to contain certain contradictions. I am rather glad for one that there are contradictions, because it allows greater latitude in carrying it out. When your men are in extended order, you must rely upon previous teaching and discipline, and upon what the Germans call "fire discipline." You must have educated your battalion so that when once *lancé* to the attack it may to a certain degree be able to act without the supervision of the Colonel. You must have taught your Officers according to their grades and also your non-commissioned officers, and you must have instructed them so far as possible individually, so that they may take command, and be prepared to act as occasions may present themselves without the direct supervision of the senior Officers.

With reference to the four-deep formation, I think I may compliment Colonel Macdonald on having attacked the present formation of fours which very few regular Officers would have done. We have got the present system so imbued into our minds that we never think of forming fours differently than according to the present method, and Colonel Macdonald has put before us another way of doing it which appears at first sight simpler and better. But with regard to using the four-deep formation as the means of open order attack, I think there is this difficulty. As long as you are acting on a smooth surface, or where everything is perfectly regular, and where the different units fit into their proper places, all goes well; but suppose as you are marching forward to the attack, with your front line of fours, you see a position on your right or left which it is necessary to seize (and this will be often found to take place not only in action but also

on field days over rough ground where you have a supposed enemy in front of you), the Officer using his own discretion moves the support to right or left; immediately the whole system of attack is upset, and confusion becomes worse confounded. Doubtless under the present system there must be confusion: and what you must do is to educate your Officers and non-commissioned officers to act in confusion. You must imitate confusion continually, and you must teach them the habit of commanding men in front of them although these men may be intermingled and of different companies. I think this is the criticism I will venture to make upon the four-deep formation. With regard to the retirement after an attack, you must depend upon having a certain portion of your force well in hand to cover retreat, as I think it is almost impossible to rely upon a beaten force falling back upon the several four-deep formations as shown in the diagram. But supposing this formation were carried out, it would require also a different system of disciplining your company. If your men are to act in four lines in the way indicated, you must divide your company up into four similar sections, so that each of your sections shall be commanded properly according to their formation, and not as at present when standing in line; for nothing can be more important than that your section should be properly and intelligently commanded by their own sectional leaders; and also it is of immense importance that the men who stand together, should act and work together both in field and camp. Therefore, to carry out the four-deep system a new disciplinary formation as well as a new tactical formation would be required. I do not say this as an argument against the system, but point it out as a corollary that should necessarily ensue from its adoption.

Lieutenant-Colonel BLUNDELL, Grenadier Guards: Gentlemen, we must all, I think, agree with Colonel Macdonald in his aim of attempting reconstruction when the line is formed for the final rush, if it is possible, but I for one doubt its being possible. I have had a good deal of practice in skirmishing companies, not in the field but on parade, and I must say I think it quite uncertain if you divide a company (when several companies are acting in line together in extended order), I consider it quite uncertain, if you divide a company and let one-half company support the other half, whether, when you want to reinforce the half company in front, its own half company will reinforce it: you find there is a certain drifting of the line, there is smoke and confusion, and my belief is, if a Captain of a company wants to command his company properly, he should be in the rear of the centre, and that the whole company, not too long, should be in one single line. He has then perfect control, no matter how long it is, he passes orders along the rear, whereas if he has to be hopping between the half company in the front line and the other half company, perhaps a couple of hundred yards behind, the chances are he will lose one, perhaps both. I think we should be very careful about the use of terms. A great deal has been said about the Prussian "company." Now, I contend that there is no doubt the Prussians gained a great advantage by the use of that large company of 250 men, but it was not because it was a "company," but in spite of its being a "company." It acted as a battalion, and they gained their advantages by using small battalions. Their companies became, in fact, small battalions. It has always been considered in the British service that a company of 32 files is about the handiest body you can use, and you find that four "companies," of 32 files, will not differ much from the strength of the Prussian "company"; that is to say, one British half battalion, of four companies each of 32 files. It is as perfect a unit as you could possibly have to use in the field; and if you identified the Major with his half battalion in practice as much as he is in theory, you would at once have what you may term a Prussian "company" if you like the word, but better organized, and, in reality, a battalion composed of four integers, each under, suppose we term them, Commanders, and we similarly styled the Sub-Lieutenants, Lieutenants. I believe that would be the very best arrangement, and I think with our attack formation you would at once arrive at that, if in distributing the companies at first you so arranged it that when your battalion was all thrown out, the reserves reinforcing the fighting line, you had your right half battalion on your right and your left on your left. To this extent I believe reconstruction is possible; the book permits it but it does not suggest it as the normal formation. Then there is another point I should like to mention. Even before the Crimean War, it was a

matter of indifference in what order the battalions stood in the brigade. You might invert them to any extent. It was all perfectly natural, but, at the same time, the companies in a battalion, except in light division regiments, were rigidly kept, as Colonel Macdonald very properly observed, to their particular order. Now, the order of companies in a battalion is a matter of perfect indifference; they change their order at any time and no inconvenience is felt. I believe we have arrived at a time when we must go beyond this. I believe it is a perfect matter of indifference in what order a man stands in his company. I believe you may take a company of men who are properly drilled, and without any telling off at all, you might give them the word "fours right," give them the caution to take their time from the right, just as they do in dressing, and you would find the company would form fours without any telling off at all. That is what we have to make the men understand, that there is no real danger in Smith being on the right of Brown, any more than in Brown being on the right of Smith. We find that custom lingers long everywhere, especially in the Army. It is the commonest thing possible to find a man who would bolt his front door with two bolts, lock it, put a chain upon it, and, at the same time, leave the window within two or three yards of it with the latch undone. That is no doubt custom, the remains of the time when the weak point in all houses was the doorway. So in the Army: in old times the great danger to infantry was a cavalry charge, and the infantry was obliged to be prepared to form hollow square to resist cavalry, with the least exposure to artillery. Now there is no occasion for anything of that sort. The only chance cavalry can have against unshaken infantry is to catch them by surprise, and when infantry is caught by surprise, you may just as well form quarter or close column, or rallying squares, as anything else. The necessity of forming hollow squares was the only reason for being very particular in maintaining the proper order of men in a company, or companies, in a battalion. The last has gone and we ought to accommodate ourselves to existing circumstances in the former.[1] With regard to the formation of fours that Colonel Macdonald has suggested, it appears to be a very simple one, but I think it is a matter of comparative indifference, whether a company, before it commences to advance, is two deep or four deep. I think it is a pity we do not retain the formation of threes for moving upon roads not wide enough for fours.

Captain E. VAUGHAN-JONES, London Irish Rifle Volunteers:[2] I thought Colonel Macdonald's desire for reconstruction was good, but that his scheme for effecting it would be unworkable in a real attack, because the confusion and loss of direction, incidental to troops moving in extended order over broken ground, would prevent his third and fourth ranks (forming his reserve) finding their own companies, as we must bear in mind the great depth between them and the front, and the probability is, that when they arrived at the front (in hot haste), they would be absorbed just where they came up, and that it would be almost impossible that men would arrive so exactly at their places as to reconstruct the companies.

I then stated there were many advantages possessed by the old line formation (which I pointed out), and that I thought it was quite capable of being developed to meet the circumstances of the time, by, as it were, engrafting upon it a workable revised system of attack, and I most respectfully submit, with all deference, the following suggestions (as stated in my paper). Allow the troops to move over a portion of the space between them and the enemy in the old line formation, but with scouts out, which will afford proper command by the senior and more experienced Officers, and when the edge of the zone of musketry fire has been reached (say at 1,000 yards from the enemy, or earlier if annoyed by his shell fire), unleash by halting the left companies (2, 4, 6, and so on) which will form reserve under the senior Major, the right companies, still moving on, form single rank from the right (the direction, touch, and command is then obtained as before). When this single rank arrived to within 700 or 800 yards of the enemy (or earlier if exposed to shell-fire), halt the rear rank men, who will form supports and keep their

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[1] It is not intended to advocate disorder, but to urge that when disorder occurs, as it inevitably must, the situation may be accepted with composure.

[2] The following is a précis of a written statement handed in by Captain Jones.

extended order (the Lieutenants to be in charge of these, and the junior Major having general charge of the whole). The front rank men move on, being then in extended order, and form the fighting line under the Captains.

In such a formation the whole would be "in hand," the Captains would have their commands in two ranks (one the fighting rank and the other the supporting rank), with a front of 50 paces for 32 files, instead of 128 paces as at present. The rear-rank men to conform to the movements of the front, so that when the Captains send their links (buglers or sergeants) for reinforcements, they shall be able to fit into their places, or at least join their own companies. These supports could be echeloned or partly so (if found necessary for flank defence); the same must be said of the reserve, it should be in line for the most part, but where a flank is exposed, then the order in which it should stand or move must be determined according to circumstances, but I do maintain that the reserve should be composed of companies in their entirety, as they are then better fitted for flank defence, or indeed any duty.

In the event of a retreat, the front rank and rear rank would alternately retire, each supporting the other, and the reserve would so dispose itself as to check the pursuit.

If the fighting line got good cover whilst under fire, it would be quite possible to restore the old line formation, by moving up the rear ranks and causing the right companies to form two deep on the right and the left companies to move into the intervals, you would then be able to pour in a concentrated fire.

Under such a system as this, men would be held in command and comrade would join comrade (when reinforcing). Every man would be under his own Officers, and all the confusion and clashing of commands, such as at present take place, would be avoided.

Lieut.-General Olpherts, V.C., C.B.: I came here this evening quite unexpectedly, and had not the slightest idea of venturing to speak before a company which contains, I am certain, Officers who are far more capable of speaking on the subject than I am. I may, however, state that during the time I was in India, where I had the opportunity of commanding brigades and divisions, an Officer named Lieut.-Colonel Bigge, of Her Majesty's 5th Fusiliers, brought to my notice a system of attack which I tried in the Bareilly (or Rohilkund) Brigade and the Lucknow (or Oude) Division, where it answered admirably. I quite agree with the spirit of what Colonel Macdonald has said, and I am not presuming to say the system I wish to point out to you is better than his; but I desire to mention it to you. It is, in some respects, similar to Colonel Macdonald's. It is based on the company system, but the difference is instead of acting by fours Colonel Bigge acted by sections, and the advantage of that was, as a speaker in front of me said, that the men of each section were under the immediate command of their own non-commissioned officers, and knew them better than they would others. I think that is an advantage. I used to call it the telescope system, it shut up so very conveniently, closed, and became a compact formation, as Colonel Macdonald advocates. I have not read much lately about subjects of this kind, and I am not able perhaps to use all the technical terms that would convey my meaning to you so well as others, but I have simply wished to mention to you as a fact that Colonel Bigge did produce that system, I believe, before any other similar one, and that I found it answer in practice remarkably well.[1]

[1] As an example I give the following plan:—No. 1 Section (it does not signify which section goes out first) covers the front of its own company in extended order; the next or any other section as ordered forms the support, the files being opened out as required; the remaining section forms the reserve. The Captain is usually between the front line and support, with connecting links and intelligent men to convey orders. An advantage of this system over the four-deep one appears to be that by having the support and reserve more compact and in hand, you can protect a flank and reinforce any particular point in the front line more effectually. I have also found it very handy and effective in retiring movements. At the same time I can quite understand that the four-deep system may be an equally useful and practicable one. What is required is that all should act together with one mind to fulfil

Lieut.-Colonel GORDON IVES, 36th Middlesex Rifle Regiment: I am not perfectly clear whether Colonel Macdonald intended the original formation to be four deep or to form four deep from the original formation of two, because there is a very considerable difference. [Colonel MACDONALD: It was four deep from the very first, the normal condition.] That, then, avoids telling off. Some two years ago I happened to be attending the manœuvres in Germany, and I worked this question out with various friends of mine at that time. I had not read Colonel Macdonald's book, but we all thought a four-deep formation was capable of being worked up into a drill which should recommend itself by its simplicity; but in order to make use of it, it appeared to me to be necessary to make a very great change in the system adopted of dividing the company into four parts. If you adopt the four-deep formation to start with, of course you avoid telling off altogether: you form two deep with the greatest possible ease, but then you have a disconnected line, consequently it is necessary to divide that line in some form or other. If you divide it into sections in the way it is done now, you mix up the men in an inconvenient manner; but if you take it that each line forms a section, 1, 2, 3, 4 sections, each line is a section in itself, it obviates this entirely, and each line forms a competent body in itself. If you subdivide this again, making the men tell off from one flank to the other, you avoid all telling off that is not done by the men themselves, and in various ways you can get one of the first principles of the drill of the Prussian Army, which is the group of eight to twelve or sixteen, each group commanded by a leader, which is the foundation of their first line. The difference between the Prussian line of attack and that of other countries, as far as I have seen, is that they subdivide their line entirely into groups of eight, twelve, or sixteen men, generally commanded by a sub-officer, whose duty it is to superintend the doings of these men. When the reinforcement of the front line takes place, what with us would probably be a section, would with the Prussians be really and truly probably nothing but a group, which being very small is easily sent into the front line; whereas a large section in companies of 80 to 100 men, if subdivided into sections, is no longer a small body of men to bring into the front line, and requires a gap difficult to form and fill up, or as is now done the men are all mixed up. A very important part of the Prussian system is its perfect uniformity. Go from one end of Germany to the other and you will see exactly the same drill. Our drill-book leaves us so much liberty of action that at the last moment, when at manœuvres, we are going to attack an enemy, it may be by the right, left, or centre, but nobody has ever been able to tell me for certain where the centre is, whether the centre of a brigade, division, battalion, or company. What we seem to want is not to be told how a thing can be done, but to be told exactly what we are to do. Commanding —never mind what—a battalion a company, two men if you like—I do not want to be told I can place two men 5 yards or 100 yards apart: I want to be told exactly

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a particular purpose, while each individual develops, as far as possible, his own special qualities, like as a pack of wolves, guided by instinct, collectively and separately follow up and attack those they pursue and seek to devour; while bodies of men, guided by reason and actuated and animated by discipline and principle, endeavour to frustrate and overcome each other's designs by masterly and scientific combinations, in which the power of the superior mind, which directs the whole, increases in proportion to the greater amount of individual intelligence which it reflects.

Rough Sketch of Company advancing to the Attack.

No. 1 Section.

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No. 2 as Support.

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3 and 4 Reserve.

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what I am to do with my two men by my superior Officer. And if that is applicable to the two men, how much more applicable is it when you come to your 50,000 100,000, or 200,000 men. How impossible it is to imagine the confusion that will arise unless every individual knows what he is to do. It is no good talking of discipline unless a man knows what to do; however willing he may be, he cannot do it. What we want, is not to be told to advance by right, left, or centre, but to advance under a general rule, any deviation from which rule to be such an exception as will make a mark upon our minds. I do not know that these remarks are very relevant to the exact question before us, but what is relevant is to get a system of drill which cannot be deviated from except in rare instances, carrying with them great responsibility. It is perfectly true, as Colonel Macdonald said, that in former days each company had its particular place, and there was, in my opinion, an advantage even in that; and there would be still if each company or each man knew what he had to do. I doubt not but that the result of this discussion will be that my suggestions will be considered by the many distinguished Officers present, and finally settled, so that when we have to face the enemy we shall know what we really have to do, and then I feel perfect confidence that there are very few of us who will not do it.

Captain WOODHOUSE: Colonel Macdonald has confined himself almost entirely to the consideration of the subject as it affects the smallest tactical unit, viz., the company. This must be my excuse for venturing to make a few remarks in the presence of so many of my seniors. As a company Officer I wish to thank Colonel Macdonald for the boon he would bestow upon us. There is not a Captain in the Army who would deny that under the present system the moment of victory is one of inextricable confusion; what the upshot would be if, when the men fix bayonets, quicken their pace and charge, defeat, and not victory should ensue, the drill-book does not inform, nor the orthodox parade instruct us. Officers, however, have a shrewd suspicion. The commander of a skirmishing company labours under many disadvantages at the best of times, but not till he has been reinforced once, twice, and thrice by successive supports, and not till fresh men and strange faces have been wedged in between his own men, and he himself is surrounded by Officers and non-commissioned officers of other companies, can he really be said to have reached the climax of helplessness. The "four-deep" system seems to remedy most of these evils by diminishing the front which he has to control, by giving him undivided command over each reinforcement as it arrives, and by ensuring mutual acquaintance between each unit of the fighting line and its particular commander. No doubt actual experience would induce modifications here and there, but for the proposal and for the principle of the scheme the thanks of all company Officers are due to Colonel Macdonald.

Colonel RADCLIFFE: Sir Garnet Wolseley, I have very few words to say on this subject. I had the privilege some years ago of reading a pamphlet by my friend Colonel Macdonald on this very subject, and I thought then, and I have always thought since, that a great deal ought to be made of this system of fours deep, and I cannot say that I have heard anything this evening which has altered that opinion. Colonel Macdonald's lucid explanation of the system made it quite clear to us all that there was a great deal in it, and I do think it is well worthy of the military authorities' consideration when they bring out a new drill-book, which I suppose will not be very long—a very few months—it is some months since we had a new drill-book. I do think that this matter requires very great consideration on their part before they dismiss it. The important part to my mind always has been, in this formation, that it does give the Captain a command over his company which he gets under no other system. Colonel Macdonald's principle is that the Captain should go out with the fighting line, which should not be an unmanageable line. It is all very well to talk of the Prussian company of 250 men and the Captain commanding that, but you must remember the Captain of that company is a mounted Officer, and pretty nearly takes the place of one of our Majors. In these days of firearms of precision it is decidedly a very great objection to have too many Officers mounted. Those of us who have the privilege of being mounted would I think keep as far out of the fighting line as possible if we did not obey the order of the present drill-book, which is to dismount under fire. I certainly should obey most implicitly that order myself, and I think all other Officers who look to their duty of superintending the troops

under their command would be wise to do the same. Now, as our Captains at present are not mounted, it is a most important thing that they should not have to double up and down a line over which they can have no possible control unless they are really ubiquitous. The great advantage of this system is that the Captain can call up his support by the connecting links whenever he finds it necessary; he can also call up the company reserve, the Officer commanding the battalion reserve having the same control over it as under the present system. But I think there cannot be the slightest doubt in any reasonable mind that it must be much better for the first support and the first reserve to come from men of the same company, and that there would be much less likelihood of the men getting into confusion. There would be the greater probability of their quickly rallying, if they belonged to the same company, than if they belonged to different companies even of the same battalion. It has been said to-night you would have men drifting off in one direction or another, and, therefore, that your supports and reserve would not come up and support in the right places. Does not that equally apply to the supports and reserves under the present system? If a commanding Officer at a distance can send up supports and reserves to support the fighting line under the present system, surely a Captain calling up his own supports and reserves with his own connecting links will do it much more satisfactorily. I do not think, however, that this is a perfect system; it will require a great deal of working out. Colonel Fletcher, of course, knows a good many of the difficulties there would be in the interior economy of the companies as to section commanders and so on, but no doubt those difficulties could be very easily got over; I do not think there is anything that could not be got over by half an hour's steady thought and working out. I was very glad to hear from a gentleman on the other side of the room (Colonel Blundell) that he had such a very high opinion of soldiers in general, and I hope also of Volunteers, that telling off was quite unnecessary, and the men would form fours simply by taking the time from the right. I should be very glad to see any battalion do it. I doubt whether Colonel Fletcher would like to call upon his regiment to do that sort of thing at a moment's notice. I know I should be very sorry to call out my battalion and ask them to do it. I am very glad to hear it can be done; of course, if so, it is a very great advantage, a very great thing indeed.

Colonel BLUNDELL: I shall be happy to do it with any company of your battalion.

Colonel RADCLIFFE: I am very glad to find you have so good an opinion of my battalion. I should be very sorry to do it myself, but I think it is a very great thing that such a thing can be done. Of course, as long as we have the present system, we have to go through a great deal of difficulty about numbering and telling off, and if we can simplify the system it would be a very great advantage. If this lecture tends to help us over these difficulties we shall be very much obliged to Colonel Macdonald; at any rate, we are very much obliged to him for the lecture he has given us.

Major-General A. CUNINGHAM ROBERTSON, C.B.: I venture to say a few words because I have actually tried Colonel Macdonald's system. Some time ago he published a small pamphlet in which the principles of his system were very clearly laid down, and which I read with great interest. About the time the Cannock Chase camp was going to be formed, I thought it would be a good thing to try the system recommended. As a matter of drill in a barrack square it works with the greatest ease—you can form your company four deep, send forward successive ranks, reinforce, and reconstruct to the front, or retire and reconstruct to the rear. It is a very easy matter; but I never had had the opportunity of trying it over half a mile or a mile of rough ground, so that I really do not know whether the difficulty caused by the drifting of the ranks in rear would be very considerable or not. That would be the chief difficulty; but I do not see any impossibility in overcoming it by throwing out a sufficient number of connecting links between the fighting and supporting, and between the supporting and reserve ranks. Concerning the objection Colonel Fletcher made that it would clash with the squad system, I think in small companies not exceeding 100 men the squad system is not a very real system. The nominal roll, it is true, is divided into squads, but the men themselves are differently divided. For tactical purposes they are told off in half companies, sections, and

fours; for the purposes of supervision and discipline they are told off sometimes by rooms, sometimes by tents, sometimes by billets, and sometimes by messes, but neither do the tactical nor do the administrative fractions ever correspond with the divisions of the squad roll. Considered as a tactical formation there can be nothing more distinct than four ranks, the men of a company can work in four ranks as well as they can if you divide them into four sections. For tactical purposes the company should always be treated as an integer; the relation between the Captain and the individual soldier should be direct. The Captain of 100 soldiers should be the commander, not of four sections, but of 50 files. When it is necessary to form the men of a company or more than a single alignment, it is better that their change of formation should be effected by opening the ranks of a four-deep line than by forming column of sections, opening, and extending. As regards the opinion held by many Officers that because it has become expedient in formations for attack to form lines of infantry with intervals between their files, therefore it will be a tactical advantage to increase the strength of the company from 100 to 200 men, and to diminish the number of the Captains of a battalion from eight to four. This opinion, whether correct or incorrect, does not at all effect the discussion of the advantages of Colonel Macdonald's system, which may be applied with exactly the same facility to strong companies as to weak.[1] It is one of the great advantages of the system that the strength of the company being given, whether it be 20 or 50 or 100 files, it provides means for securing intervals between files without increasing the extent of the front of the company even by a single pace. The objection that the interval between the files is not sufficient, and that the men are too thick, is I think just. Some months ago I printed a little pamphlet in which I suggested a modification of Colonel Macdonald's system, whereby this defect would be remedied and the intervals between the files trebled. This pamphlet may be seen in the Library of the Institution. During the summer of this year I hope that all modifications of the system of four-deep formations may be thoroughly tested at Aldershot and elsewhere by forming first single battalion and then brigades in lines, advancing rapidly without halting and keeping up a brisk fire over 1,500 yards of ground, and then halting and reinforcing. If by means of connecting links, or by any other expedient, the advance of the supporting reserve ranks can be so conducted as to prevent drifting, so that on the command to reinforce, the four ranks of each company are reunited and the company reconstructed without confusion, this will be a conclusive test of the success of the method, and will prove that it is well suited to the exigencies of war.

General McMURDO: I have very few words so say. I do not stand up with the intention of entering into the details of this discussion, or of Colonel Macdonald's proposal. I wish only to express my great pleasure, first of all in seeing my gallant friend Colonel Macdonald after so many years separation, and to find that he still has that active and intelligent interest that he had in former years in the tactical formation of the British Army as well as of the Volunteers. He possesses the instincts of his name—the name of John Macdonald, the Adjutant-General at the head

[1] It is very difficult to understand by what process of reasoning any one can arrive at the extraordinary and paradoxical conclusion that one special effect of the change from a compact to an extended formation, is to render it *tactically* advantageous to increase the strength of the company and to diminish the number of companies in a battalion. The extent of the front of a company of 100 men formed in two ranks at close order is 33 yards, that of a company of 200 men formed for attack, as directed by existing regulations, with intervals of four paces between files, is 166 yards—that is to say, the effect of the proposed change in the organization of the company and battalion would be to decrease the ratio between the number of Captains and the number of yards in the front of the line-of-battle in the proportion of one to eight, to commit to the supervision of a single Captain the same extent of front for which, in the close order formation since the time of the Romans, eight Captains have been considered necessary. To maintain that such a change is a *tactical* advantage must surely imply some confusion of thought regarding the true conditions of the question discussed.

of that department of the Army which is charged with formation and movements is well remembered at the Horse Guards at the present day, and I am delighted to see his nephew coming forward in the same line. I will confine myself simply to the question of the principle of attack. I entirely agree with Colonel Macdonald in his principle that the attack should be made by bodies that will be capable of being consolidated and formed at the point of attack in the order in which they start, or that if compelled to retire, they should do so, so as to reform equally in the same order. That I conceive to be the one great principle. Although, as a soldier, I am delighted to carry out any order of attack that may be given me, to instruct troops under my command, still, as we are here discussing the subject, I must say that I do not approve a principle of attack that culminates in confusion even if we are successful, and that might end in disaster if we are not successful. In regard to the details of Colonel Macdonald's proposal, I do not wish to enter into them. It appears to me that they are very cleverly conceived; though it strikes me the order is rather close for carrying out under fire. We should like to be a little more extended. He did propose, however, that the first line on going into action might be eliminated, by the best shots being sent forward and so a looser order might be gained; but on the whole I think that it is rather close order. However, that is a very minor point, and it can be modified and altered according to men's minds; but the principle I entirely approve of, which is, that of keeping to, or at least easily regaining, our regular order of formation.

Major-General WARRE, C.B.: There is one point I think Colonel Macdonald has omitted to mention, and that is, the question of non-commissioned officers; for, however perfect his formation may be, I do not think he can command it without the aid of non-commissioned officers.

Lieutenant-Colonel Lord ELCHO, M.P., Commanding London Scottish Rifle Volunteers: I can assure this distinguished company that if it had not been for some sort of command, some sign made to me by Sir Garnet Wolseley, I should not have ventured to have spoken, more especially as several Volunteer Officers have already spoken, and I am sorry to say we have not had as much criticism as one hoped to hear from Officers of the Army on this most important question. It would be most impertinent in me to pretend as a civilian to criticise what the military authorities, after many years' gestation, have produced in the way of the last form of attack; but I hold myself, not having seen it in practice, but simply having read it on paper, that what General McMurdo has said appears to be the truth with regard to it, that in success it will culminate in confusion, and if unsuccessful in disaster. Where companies are mixed up, where even if you are in brigade, battalions will be mixed up when they come to reinforce the originally extended battalion, it appears to me, as Colonel Macdonald has said—speaking as a civilian with no experience of actual warfare—you must more or less tend by this system to inaugurate confusion at the very commencement. As the matter stands between the two systems, there may be no doubt objections such as Colonel Fletcher has mentioned with reference to Colonel Macdonald's proposal; but of the two it appears to me to be founded on a much sounder system than the one which has been published as the new attack, and to be simpler in itself. Colonel Fletcher made one remark which struck me very much, and it was this: he said the whole secret of the new attack was to educate your men individually. Now I think what one ought to recollect is this: that you have a very young army to deal with, consisting in a great measure of recruits and boys, and if you have a system which, according to General McMurdo, even in success will culminate in confusion, there is still greater danger of disaster, considering the elements with which you have to deal. I know that Sir Garnet Wolseley is quoted as an authority for preferring young soldiers to old soldiers. But there are young soldiers and young soldiers, if I may so say, and though I hear General Sir Garnet Wolseley quoted as an authority in favour of young soldiers, I should be very much surprised, if I were to hear him say that by "young soldiers" he meant raw boys of from 16 to 20 years of age. I rather gather, when his authority is seized upon in defence of sending these boys into the ranks at this early age, that he means that he would prefer a soldier of 20 or 30 to a soldier of 40, and that he looks upon the Prussian military age as the best age, beginning with soldiers at 20 and taking them to 32, and that he means

by that young soldiers. I think that is a matter that ought to be considered, that you should as far as possible adapt your system to the troops, and that the system at present laid down is one likely to lead to confusion by the mixing up of units, and that the sounder principle is that advocated by Colonel Macdonald. I must apologise for what I have said, but that is what strikes a civilian, in looking with a common sense eye at these simply military questions.

Lieutenant-Colonel HENRY BRACKENBURY, R.A.: May I venture, although not an infantry Officer, to make one or two remarks on this subject? I quite agree with Colonel Fletcher, and I think every one here will, that we should not adopt anything simply because it is German. That danger, I venture to say, is Scylla; and on the other side there is Charybdis, which is the danger lest we should reject anything, simply because it is German, and there is a little tendency, I think, in a good many minds to do so. The Germans, I think we must all admit, are an eminently practical people, especially in military matters; and having seen something of the German troops during their war with France, and having had opportunities of conversation with German Officers, I venture to say there is one great principle—not a matter of detail, but a great principle—which pervades their whole system of infantry formation and infantry attack; and that principle is the division of responsibility. Just as our battalion is divided into companies, so are their battalion and company divided and subdivided, the great essential principle being that no matter how small a group is separated from the force, it is an organized unit. They subdivide their company into groups; each of those groups is trained to work together under a non-commissioned officer, who is constantly and permanently with it, who knows every one of the men composing it, and to whom they are always accustomed to look. I tried many times during the war of 1870 to get past a German outpost. I have gone with all the papers imaginable in my hands, but I never could succeed in getting at once through an outpost. Every time I was met by precisely the same rigid formula:—"There you must halt till my non-"commissioned officer has been called." My non-commissioned officer comes and he says, "Here you wait under charge of two of my men till my officer has "been called," and "my Officer" referred me with an escort to the Field Officer commanding the outposts, perhaps a couple of miles back. I have gone through French outposts without such formality over and over again, and I am certain the one thing that makes the German outpost system so complete is that the chain of responsibility is absolutely complete. It is exactly the same thing in fighting. No line, with a front of 25 men, I venture to think, can possibly advance over broken ground, for anything like the distance which men have to advance to the attack, without getting broken up into fragments. And I should be extremely glad if Colonel Macdonald would point out to us how he proposes to divide his company, as it there is, into sections, or into fire groups, so that there shall be complete control by the non-commissioned officer in charge of each of those groups? In the ordinary formation in two ranks, both ranks advance together, and if a section or group of 12 or 8 men advances, it advances all at the same time, and its leader advances with it. But suppose we have a group of 12 men under this system, they are in four ranks. Three men advance from the front rank. Is the non-commissioned officer to go with them? Three men follow—is he to go with them, or is he to remain with the six behind? I shall be very glad if Colonel Macdonald will explain to us, in some way, how he proposes this subdivision of responsibility under his system.

Colonel MACDONALD: I am sure I use no mere words of course, when I express to this meeting my thanks for the extremely kind and generous way in which they have received my paper, and I cannot help thinking the principles I have advocated have been highly honoured by receiving criticism from the gallant and distinguished Officers who have taken the trouble to come here to-night and to address this meeting. I cannot help feeling that in one thing which Colonel Fletcher said I agree, though in quite a different spirit, namely, in what he said about the allowable things in our drill-book, and about a great many things in our field exercises book being matters of compromise. Speaking as a Volunteer, I am sure I express the opinions of every Volunteer Officer, by saying that one of the greatest misfortunes about our drill-book is that it contains so many compromises; you are given two or three

ways of doing a thing, and you have the fear very much that you may choose the one which your inspecting Officer does not like, and, accordingly, you generally take the old one, and the new one, which is infinitely better, but does not please the old minds, is practically set aside. I will give you a practical instance of that. There was introduced, some years ago, a substitute for the old gate-wheel, a process of forming by which the men came up much more rapidly, as accurately and as neatly in the end, into the position into which they were to be brought, instead of being made to do the most insane thing on the face of the earth—to touch one way and look another. I venture to ask any gentleman in this room, whether, within the last six or seven years, he has ever seen anything of the kind done, except on some occasion when his corps was turned into some place that was not flat, and when, though he gave the order to wheel, the result was the forming process. No doubt it is a valuable thing to have experiments on, but I think they should be tried before their publication by Her Majesty's authority, and when a mode is found of doing a particular movement, it should be decided, either that it is preferable and is to be substituted for the old mode, or it should be decided that you are not quite satisfied with it and will leave it out altogether.

As regards the difficulty suggested by Colonel Blundell, about the Officer commanding so many men in front, who are out in the attacking line, and the difficulty he would have in hopping backwards and forwards between those men and the men behind, I rather think that proceeds from a mistake. The men in support and the men in reserve have nothing to do but to wait till they get orders, and the orders can be as readily sent to them, by word of mouth, or by a note written upon a piece of paper, if that be necessary, as by the Captain hopping back himself to do it. I certainly would highly disapprove of his doing so. He can take hold of them the moment they come up near him, but as long as they are behind, they are simply like people waiting until a message is sent to them, and they have to obey that message. When they are brought up by the Officer on the spot to the front, then they fall at once under the direct command of the Officer taking charge in front. I may here just say a word with reference to Colonel Brackenbury's reference to my not having stated anything as to the detail of adjusting commands. No doubt that is a very important matter, and it is one about which my experience did not enable me to make efficient suggestions; but what I would say is this, that it does not appear to me, after hearing Colonel Brackenbury's question, that there would be any more difficulty in effecting good grouping under this system than under any other. It occurs to me in this way. Of course, if you have men out in front and the men who are to come up behind, both in the support and in the reserve, those men may be practically one group, although they are individually for the time separated from one another because they can have a thoroughly integral cohesion. The only separation between them is one of space, but the whole concentration of the minds of those men who are behind, and of whoever is in charge of them for the time must be upon this, that their future position is alongside of the men of their own group, and, therefore, I do not think that would create a practical difficulty. Take, for example, the case of our 25 men of a company of 100 thrown out first. As men came up from the support they would fall each into his own group; the non-commissioned officer out in front would just receive and put them into his group, exactly in the same way as he took charge of the men already up. That was my idea of it, although I cannot profess to state it in detail.

Then, as regards drift and loss of direction, I think it is rather hard that anything should be said against a proposed system on that ground, because I have not heard it suggested that any system has ever been devised that has prevented drift and loss of direction. But I am rather inclined to have the courage to claim for my idea the prospect of less general drift and loss of direction than results from any other system.

Colonel Brackenbury said, with great truth, that the thing that is wanted is that every man and every non-commissioned officer and person in charge of the men should know exactly what he had got to do. In our old system the thing was, as was said by one of the speakers, you had to advance by the centre, right, or left. I think the day for that is completely gone. That is a bowling-green principle, utterly inapplicable to broken ground. What you want is such directions given as

that the flank of a battalion shall be brought up to a particular point ahead, and the other flank up to another point ahead, and then you cannot drift unless you disobey those orders; you may get a little thicker at one place and a little thinner at another place, but there can be no drift of your main body at all. I am inclined to think that we make a mistake in making our support follow, in parallel line, with our advanced line, and I have often wondered whether it would not be a much better plan that the support should have its two ends moving in a kind of echelon of men, so as to be keeping up its connectedness at one end with part of the force in front, and at the other end with the reserve in the rear. Of course the flank from which you advance from the support would depend very much on where your enemy's artillery were, but I cannot help thinking that if some connectedness were kept up in that way, you would prevent two things, first, loss of connection, and second—

Colonel GIPPS, Scots Guards: Take this to be the right of your support, what is your right hand man doing while your left hand man is keeping up there?

Colonel MACDONALD: As long as he is standing still there he is the luckiest man of the whole, because he is beside the reserve which is supposed to be under cover.

Colonel GIPPS: In taking positions there will not be cover for every man who has to stand still. Take the man next to the right hand man, there cannot be cover for him too; you cannot have them all under cover.

Colonel MACDONALD: Each man will be exposed according to the position in which he is, and it is perfectly obvious if you put them in a diagonal instead of a parallel, they cannot all be in equal danger.

Colonel GIPPS: The object is to get the men up to the front.

Colonel MACDONALD: When you want to push them up into the line they will all go as fast as they can. I do not see that working it in a diagonal would expose any man a bit more than he is exposed now. On the contrary I was going to suggest, when Colonel Gipps put the question to me, that it is perfectly certain that if your support can be fired upon at all, and you keep it parallel with the front line, your enemy has only to know the distance that your support is behind your advance line to fire upon it with very great certainty if he has opportunity of doing so with his artillery, whereas if you worked it alternately, pushing up this side and then the other side, the enemy would not have a chance of doing so. But, however that may be, I think the question of keeping up the connectedness between your advanced line, your support, and your reserve is the same, whatever system you adopt, with this difference only, that in cases where the support and reserve belong to the same tactical unit as the advanced line you have the interest to keep up a careful connectedness—you have the interest of common comradeship to keep it up, whereas in the other case you have nothing of the kind. It is quite certain if any mistake occurs it is less likely to cause serious damage because a mistake will only extend along a line of twenty-five instead of a hundred men. With twenty-five men you are pretty certain to have them well within reach and call, whereas with a hundred men, seventy or eighty may be completely out of your sight, and may be gone, and you will never find them for the rest of the day. I was present at the autumn manœuvres in 1872, and there were two engagements on successive days, on which I should have felt very much ashamed of myself, for before I had been three-quarters of an hour in action, I had only about two companies out of my whole regiment, if it had not been that the battalion of the Rifle Brigade close beside me was exactly in the same predicament. Referring to what Captain Jones said about the shoulder to shoulder, and the electric sympathy between men rubbing shoulders together, that is all very well as long as they are rubbing shoulder to shoulder; but if the effect of your bringing them shoulder to shoulder is that they are reduced practically down to being at four deep interval, and with only two ranks, your electric effect is gone and half your force is gone too.

General Olpherts spoke of the telescope principle, but I think my telescope is a better one than his, for this reason. In my case each group of four men is a telescope; the first man in the front pushed out, when the next follows him and the next follows *him*; each group is a telescope, each company is a telescope, each battalion is a telescope, and the whole brigade is telescoped exactly on the same principle throughout; whereas if you take the sections of a company and divide

them, you are just clubbing in exactly the same way, only in a less degree as you do if you club companies or battalions.

General OLPHERTS: Mine was more on the binocular principle.

Colonel MACDONALD: Let me say in conclusion, that if the paper I have been able to read to night contributes to a full discussion of the question I shall be fully rewarded for my trouble, and I beg to express my thanks to you for the great and kind attention you have given me.

The CHAIRMAN: Gentlemen, Colonel Macdonald began his very interesting lecture by apologising for his presumption in addressing an audience composed not only of Volunteers like himself, but also of regular soldiers. I venture to concur in all the remarks that were made on this point by Colonel Fletcher, because I think it is of the greatest possible advantage to the Army generally, that questions like that at the present moment under our consideration, should be considered and should be thought and written about and talked of not only by professional soldiers but by all Militia and Volunteer Officers; in fact, I would go further and say, that if you look back to all the great reforms that have been effected, not only in our military administration, but I might say in our tactical formations, a very large proportion of them have been at most forced upon the Army by outside pressure, and that outside pressure has within the last fifteen or sixteen years almost invariably come from the Volunteer force. Now, like Colonel Radcliffe, who told us he had some years ago read Colonel Macdonald's pamphlet on this subject, I also read it, and with the greatest possible attention and interest, and it struck me then, as it strikes me now, as being a most simple solution to a very great and difficult problem, the problem which is now of most interest to all armies in the world, and especially to us at this present moment, that is, the problem of what is the best formation to adopt whilst engaged in getting over the space, especially if there is no cover, that must intervene between your line of battle and that of your enemy. As far as I have able to follow the lecturer and understand the process by which he means to solve this problem, it is a very simple one. Hitherto we have been in the habit of sending out companies, and extending them to very great distances, whereas he, on the other hand, has adopted the very simple process of sending out the successive ranks of his companies as skirmishers, supports, &c., each of which ranks covers the same extent of front as the company itself when deployed. By this means he secures a great unity of action for the company, and he also provides for the great desideratum which I believe is essentially necessary in these matters, viz., that the Captain should be able to exercise due and efficient command along the extent of front over which his men are acting. I think of all the great mistakes which can possibly be made in tactical formations, the greatest is to send out a Captain and tell him to look over a company of 100 or 125 men, extending over 150 or 200 yards. As far as I can make out, the system laid down in the drill-books at the present moment is that two companies are sent to the front, and are told to spread over an extent of country representing what a battalion deployed in line would occupy. It is however, I am glad to say, also laid down that there are alternative measures open to the colonel commanding a battalion. I do not quite fully concur in the remarks made by some speakers upon that subject, when they said it was absolutely necessary that it should be laid down in the drill-book in the most stringent manner that you should always do a certain thing at a certain moment. I believe nothing could be more fatal than if a Commanding Officer's hands were tied, and he was told that under all circumstances he must always employ the same formation. I think it is open to complaint, as that complaint has been made this evening, that the drill-book as now published recommends to the Officers of the Army a system that I believe it would be absolutely impossible to carry out in the field. I do not myself believe it would be possible for any man to command effectively a company extended over 100 or 150 yards. During my career I have had several opportunities of commanding skirmishers in action under the old system of leaving three or four paces interval between the files. During the Indian Mutiny my company numbered over 100 men, and I can say most positively, that upon every single occasion when it was employed in skirmishing order, before I had been long in action I had lost about one-third or one-half of it, not killed or wounded, but lost sight of altogether for the time being. I could exercise no influence over the skirmishers at a distance from me; they dis-

appeared, got into hollows, into ditches. and behind houses, and I was able to give them no impulse whatever. I commanded the small number of men that were round me, but the others disappeared altogether. I found them at the end of the day, but during the action they were entirely lost. That was so thoroughly impressed upon my mind that when I hear now-a-days gentlemen who are blind worshippers of success, and blind worshippers of the Prussian system, I always feel inclined to ask them, "Have you ever commanded 100 men in action?" because if you have commanded 100 men, extended in the old skirmishing line, I am quite convinced you would never recommend that a Captain should be told off to command 250. If there is one thing more true than another it is the principle that has been recommended by Von Scherf and others, which is that all formations for tactical purposes should be in depth and not in breadth; that whether it is a Colonel, or a Captain, or a Brigadier, the great thing is to contract the extent of front over which he is to exercise immediate command. Give him any depth you like, let him have two, three, four, or five lines, one behind the other, but let the extent of front over which he is personally to direct his troops be as narrow as possible. And to come down from great things to small things and take companies, I think what was said by General Robertson is most true, that it is most desirable in laying down a drill for our regiments to accept the principle that we should have small companies, and that a company should never extend over more than 50 or 60 yards. I believe that distance can be almost laid down by physical laws; your voice does not extend during a great row and noise over more than that distance. You can scarcely see in action more than 50 or 60 yards, therefore I would lay that down as the general limit of extent to which companies should extend in action. If that is true, the system recommended by the lecturer, of having four lines, is a most simple one. I do not know whether any gentlemen here are well acquainted with the American system of skirmishing, but it comes very much to the same thing as that recommended by Colonel Macdonald. It is not exactly the same principle of formation to begin with, but it amounts to very much the same thing in the end. They tell their men off in fours; each No. 1 goes out to skirmish. The next man who goes out to support him is No. 2; then No. 3, and then No. 4, each leaving his rear-rank man behind him. When, therefore, the whole of the front rank is in the skirmishing line, the rear-rank men in rank-entire still remain as a support. When the front rank, whilst so skirmishing, wants support, each No. 1 of the fours of the rear rank goes to support him; if further support is required, then No. 2 and so on. It is very much the system that Colonel Macdonald recommends, except that it is partially inverted, the *modus operandi* being somewhat different. I think Colonel Macdonald's system of fours is a very simple one. With reference to the Americans, most of their formations are in fours. For many years past they have adopted a great simplicity of drill, which I am glad to see the authorities of England are becoming alive to the necessity of our adopting also; indeed, that great rigidity of movement, which we had borrowed from Prussia, is, I think, gradually disappearing from our drill-book; and I, in common with a great number of others who are thinkers upon these subjects, congratulate the Army upon the fact. Still I must admit that I am a great advocate for drill. I often hear people say drill is of no use. Now I think drill is of the greatest possible use, but I am all for drill of a very simple, practical, and instructive nature. I contend that it is quite possible to make a recruit into a drilled man by drilling him to useful formations and in movements of common occurrence during war, and that it is an absurd waste of time to occupy the hours daily devoted to drill, by putting him through evolutions that he never can possibly use on active service. The more you make your drill resemble the manœuvres and evolutions you must employ in the field, the better; and as I believe the days of all stiff movements are over, I think we ought to consider what takes place in action, and reasoning back, adapt our drill to meet that contingency. Hitherto we have had some preconceived extraordinary notion of what battles ought to be, and we have drilled up to their fancied requirements; but we ought to do exactly the reverse; we should find out what an action really is like, and then modify and adapt our drill to provide for these tactical realities. Now I certainly believe the culminating part of any action is utter confusion. I do not care whether the soldiers are Germans, French, or any other nation; the actual culminating point, the decisive

moment of any battle, is an exciting confusion. Therefore I think in our drill we ought to accept that confusion, to prepare for it, to recognise that it is an absolutely essential part of every general action to drill up to it, and frame our regulations with a view to meeting it, and not to ignore it and say it is a thing you ought to avoid. You cannot avoid it, and as you cannot avoid it you ought to be prepared for it. There are two points to which I do not think sufficient importance was attached in the discussion. They are not great points, but still I do not think enough prominence was given to them, especially as one of them is not remarked upon in our drill-book. I believe the day has come when colours can no longer be carried in action. I do not believe it would be possible to carry a battalion's colours up to the enemy's line, and I hope the gentleman who thinks otherwise, and who recommends that in our next war we should still retain their use, will have himself to carry them in action, and I wish him joy if he does. That is my opinion, and I think anyone who considers the matter will concur with me. I would remind those Officers whom I have the pleasure of addressing, that we have more colours than any other nation in Europe. That whereas most nations have perhaps one colour to a battalion at the outside, and some only one to a regiment, we have two colours to every weak battalion in our Service; in fact, we certainly have three times as many colours, and in some instances six times as many as other European nations. The other point I wish to remark upon is the question of mounted Officers. We are told that the German company of 250 men is kept in very good order because its Captain is mounted, but I think if you read the accounts of the German actions during the war of 1866 and the last war, you will knd it recorded most distinctly that the Captain, the moment he came under fire, was obliged to dismount; in fact, if he did not, either himself or his horse was shot in a very short time. Therefore I think the question about the possibility of having large companies because you can have your Captain mounted, is a myth. Your Captain cannot be mounted in action. If a Captain is to lead his men to attack the enemy, he must be on foot, and this is one of the many reasons why I believe small companies an immense improvement upon the large companies which are now so much in vogue with many of our army reformers. Colonel Blundell, I think, remarked upon the peculiarity of our drill being of a very mechanical nature, and so it is. We still retain a certain amount of mechanical process in drill. The fact was, he hit the nail on the head when he said it came down from the time when all our drill formations for the infantry were made under the terror of cavalry charges. The great idea that pervaded those who wrote our drill-books in times gone by was the necessity which existed for infantry being at all moments during an action, even when on the move, prepared to receive cavalry; therefore it was that our companies during all evolutions were kept in the most regular order so that they could at once close and form square. Those days are past and gone, because we know now we have very little to dread from great charges of cavalry, if we know how to make proper use of our rifles. I am very glad to have this opportunity of speaking about a point raised by Lord Elcho. He referred to an opinion which he says he has heard expressed as emanating from me upon the subject of young soldiers. I certainly have a great prefeernce for young soldiers, but I have the greatest possible dislike to boys, and I think there is an immense difference between the two. I have never been so wild as to wish that any regiment, or portions of Her Majesty's Army, should be composed of boys. I believe, and I say it with great earnestness at the present moment, I have the greatest horror and dread of seeing any regiment of boys asked to stand up against a regiment of men; such a contest could have only one ending, for men are men and boys are boys. I have nothing more to add on the subject which has been so well discussed this evening. Whatever may be the difference of opinion existing in this room in reference to the remarks I have made, and to the theories brought forward this evening by Colonel Macdonald, upon one point I am sure you are all agreed with me, and there will be no dissentient voice, that is, that we are all deeply indebted to Colonel Macdonald for a most interesting lecture. I am sure I may consider myself authorised, in the name of all present, to thank him most sincerely for having brought this very important subject to our notice.

LECTURE.

Monday, May 3rd, 1878.

General Sir ARTHUR A. T. CUNYNGHAME, K.C.B., &c., &c., in the Chair.

THE POPULATION, PROSPECTS, AND FUTURE GOVERNMENT OF THE TRANSVAAL.

By G. Pigot Moodie, Esq., F.R.G.S., &c., &c.

During the past year South Africa has attracted more than its accustomed share of public attention, owing in part to the annexation to the British dominion of an extensive tract of territory in that quarter, but also to the less gratifying intelligence received from thence of the recurrence of one of those intermittent and dreary Kafir wars, which not alone afford no glory but have proved so serious a bar to the progress of the Cape Colony, and have occasioned so much loss of life and of treasure both to that and to the mother country. Successive mails have also of late brought further news of outbreaks threatening among the tribes within and adjacent to the new possession; and it is owing to the interest that has been thus excited, and to the fact of information on the subject not being generally accessible, that with much diffidence I now venture, in compliance with the request of the Council of the Royal United Service Institution, to lay before you a few of the facts concerning it, which a residence there of some years has enabled me to acquire. I have been the more reluctant to enter upon this task from the knowledge of my inability to treat the subject from those points of view which will be of special interest to the gallant members of this Society, and I can only hope that though this may be the case there may be found in its novelty what may, in some degree, compensate for other deficiencies; and that if I fail to do more I may succeed in provoking enquiry that may lead to the desired result.

In endeavouring to draw your attention to the subject of my lecture, I desire at the outset to say that I wish throughout to convey such information as may bear upon what I consider will be the prominent question in the future history of that country, viz., that of our rela-

tions with the natives, and the responsibilities which are involved in the extension of British dominion that has now taken place.

It will be well known to many that prior to the annexation of the Transvaal and of Griqualand West, the native border abutting on the British possessions in South Africa was limited to that adjacent to the eastern province of the Cape Colony where the war is now occurring, and to the northern and southern boundaries of Natal. Of the first it may, I trust, be said, that the present compaign will finally end all serious difficulty in that quarter, and of the latter that it is from the northern boundary alone that future trouble need be apprehended, the Zulus being naturally a warlike and aggressive people, while those on the south, the Amapondas, live in an exposed country, are more peaceably inclined, and are too much hemmed in by the adjacent British colonies to render them a source of much danger.

The Zulu nation need also have afforded no occasion for much fear, for they, too, were in an enclosure which laid them open to attack from all sides—Natal on the south; the Transvaal and their hereditary enemies, the Amaswazi, on the west; the Portuguese settlement with their enforced tributaries under Nozingele, on the north, and the Indian Ocean on the east. Thus surrounded, and with rival claimants to the throne within the dominion, the Zulu King Cetewayo has known but too well hitherto what the result of offence on his part would be to venture upon disturbance. Recent events may, perhaps, have tended to change his position in some respects; but of this, as well as of the measures necessary to restore the previous status, an estimate may, perhaps, be formed as I proceed.

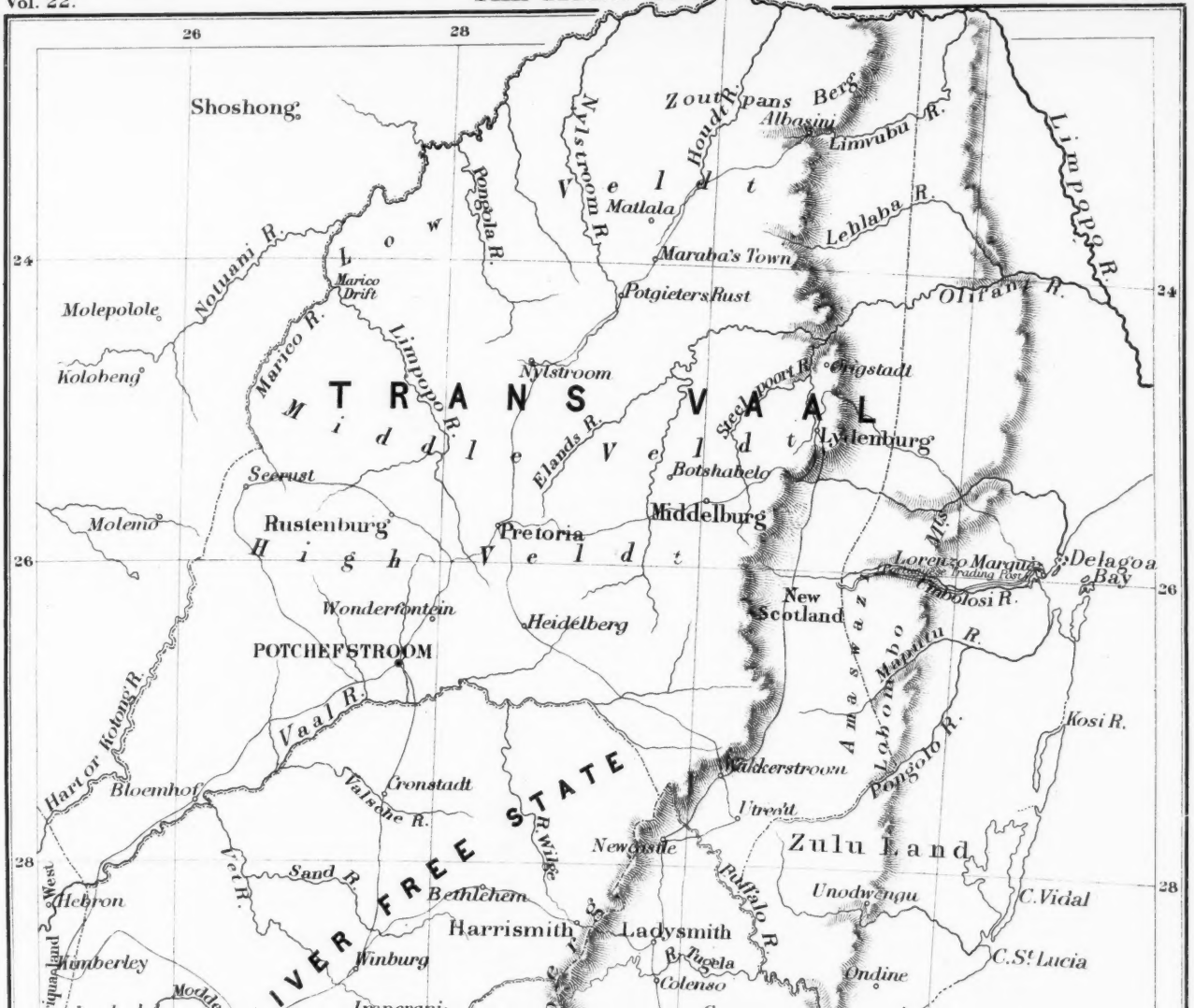
But by the annexation of the Transvaal, and of the Diamond Fields or Griqualand West, we have now, besides absorbing an enormous native population, acquired a territory with an exposed border of from 1,200 to 1,400 miles in length, the country adjacent to which is in the occupation of native tribes.

The importance of this point cannot, I think, be over-rated, for the questions which may in future arise from it admit of infinite radiation, and, if the past history of the Cape frontier be taken as a guide, may assume a character which will specially affect those to whom the protection of British interests are more immediately confided. It would, therefore, be well that in this early stage of the country's history, and in initiating measures for its future government and defence which are intended to be permanent, every consideration should be given to it.

I propose, after giving a short sketch of the past history of the Transvaal, to speak of the population, viz., Dutch Boers, the Europeans, and the natives, alluding, by the way, to the questions which may occur to me as incidental to each, and to conclude with remarks upon native policy, and the future government of the country.

The Transvaal, or what was formerly known as the South African Republic, is situated between the 22nd and 28th parallels of south latitude, to the north-west of and adjoining the colony of Natal, and is separated from the Indian Ocean on the east by the Portuguese settlement of Delagoa Bay, and the country of the Zulus. In size it is

THE TRANS VAAL.



Stanfords Geog.l Estab.t

approximately equal to the combined area of Great Britain and Ireland, or about 120,000 square miles, and contains a population which is widely estimated at from 300,000 to 1,000,000 souls. Of these about 30,000 to 35,000 are Boers, or South African farmers of Dutch extraction, 5,000 English or other Europeans, and the remaining large proportion native blacks.

It was originally colonized by the Boers, who, being dissatisfied with British rule at the Cape, had, from time to time, pushed on from thence towards the interior. It was in or about 1835 that a more organized movement took place, which in the end led to the occupation of what is now called the Orange Free State and of Natal; and it was while settling down in what was then an unoccupied tract near the northern border of the former country, that they aroused the fear or the jealousy of the neighbouring potentate Moselikatse, who, crossing the Vaal River from the north, attacked them unawares and murdered a considerable number of their party, carrying off at the same time large numbers of their cattle and some of their children. In resenting this unprovoked attack, the Boers in the following year gained a complete victory over this chief, who with his people then fled beyond the Limpopo, and established themselves in the country between that river and the Zambezi, where they have since then continued to reside. By right of this conquest the Boers claimed and exercised dominion over all the territory which had previously been under the rule of Moselikatse, and which may be generally taken to include the tract lying between the Limpopo and the Vaal Rivers. After securing the submission of the few tributary chieftains who remained behind, and who had long suffered from the inhumanity of the expelled tyrant, they then entered into occupation and set about establishing a Republican form of Government, in accordance with a patriarchial system of their own. For many years after this their position as an independent and self-governing people remained unrecognised by England, who looked upon them only as so many filibusters or renegade British subjects; but in 1852 Kafir wars at the Cape, and complications in home politics, seem to have produced a change in public feeling with regard to them. Owing to these causes philanthropic sentiment, which is somewhat liable to abnormal accumulation during long periods of repose, was for a time withdrawn, and a reaction having set in, the resolution was arrived at in England in that year to reverse the previous policy, and to acknowledge the independence of the Boers.

A Convention was accordingly entered into between the British Commissioners, Messrs. Hogge and Owen, and the Boer Representatives, by which that independence was formally guaranteed, and in which, as if with the object of more distinctly affirming the changed views in regard to native policy, a clause was introduced disclaiming, on the part of the British Government, all intention of interference thenceforward in native matters north of the Vaal. No definite boundaries were in this deed assigned to the Republican territory, except with regard to the southern border, which separated it from the Orange River Settlement, an omission which left the inference open that, to the north and in other directions, the Boers would be

allowed, as far as England was concerned, absolute liberty of range. This inference, at least, they were not slow in adopting, for, acting upon the rights thus assumed, and in the belief that the promise of non-intervention would be kept, a proclamation was at one time issued, declaring the northern border to extend as far as Lake N'Gami; but a protest against this extension having been lodged by the Cape Government, the effect has been to reduce the actual exercise of jurisdiction to the limits which, by common consent, had been accepted as the boundary of the country.

These, as I have before said, may be taken to embrace the territory bounded north-west and north by the Limpopo, and south by the Vaal River. Additions to the east were subsequently made, by treaty or purchase, from the Zulu and Amaswasi kings, and, on the south-west, a tract was also obtained as compensation for losses occasioned by war; but, with regard to these latter, disputes have arisen which have not yet been determined, and which now await a settlement under the auspices of the British Government.

From this description it will be seen that the Transvaal occupies an entirely inland position, the Portuguese territory intervening between it and the nearest harbour at Delagoa Bay. It is at the present time dependent for its communication with the coast upon the distant and difficult route by Natal, through which all produce and merchandize have to be carried by the tedious and expensive process of transport by oxen. It is by this route, also, that the troops, with their baggage and artillery-trains, have at present to travel, when proceeding to the country.

The natural port of the Transvaal is, however, that of Delagoa Bay. It is the only safe harbour between this part and Simon's Bay, and in this respect has, of course, immense advantages over the open roadstead and unapproachable bar of Natal. Its position, too, is opposite a central part of the country, and at a moderate distance, as compared to the other, while, for the purposes of railway construction, the superiority of this line over that from Natal is beyond all dispute. Hitherto, the existence of the tsetse fly, which is destructive to domesticated cattle, upon a portion of this route has militated against the opening of traffic—a difficulty which it is to be hoped will ere long be overcome by the more pachydermatous motive power of the railway engine. An objection has been raised to the opening of this route, as being prejudicial to the interests of Natal, and as tending to benefit a foreign possession, but it is to be hoped that so narrow a view will not ultimately be allowed to prevail. There is a very laudable and patriotic feeling which pervades a certain portion of the colonists of Natal, and which would seem to indicate an opinion, if not that the world was created for its special benefit, at the least that the interests of the Transvaal should be made to give way to its own, and that, in spite of the superior advantages offered by the Delagoa Bay route, the railway should be carried through the territory, and to its port of Natal; but as this would involve a sacrifice of almost vital import to the Transvaal, the latter may perhaps be excused from holding a somewhat different view. From the inland position of the country,

the question of railway communication as a means for developing its internal resources is not one which can admit of doubt or discussion. It is in this case one of imperative necessity, both to enable it to support an independent existence and to provide for its defence.

A large portion of the Transvaal lies at an elevation of from 4,000 to 6,000 feet above the sea, rising to its greatest height along the Drakensberg range, where the peaks reach to 7,000 or 8,000 feet. With these great differences in altitude there are, as will easily be conceived, corresponding varieties of temperature, the more elevated parts being cold and bracing, and the lower levels, again, quite tropical. On the whole, it may be said that the climate is exceedingly healthy, and also that it is a country in which the European race will not suffer deterioration from climatic influences.

Owing to the differences in temperature at its successive elevations, the Transvaal is also capable of a great variety of animal and vegetable production. Horned cattle and horses, as well as sheep and goats, are reared with success in different parts. Cereals of all kinds, tobacco, vegetables, and almost every variety of fruit thrive remarkably well, and sugar and coffee, though not as yet extensively grown, promise to become lucrative articles of export.

Of minerals, too, the country has a plentiful store. Coal, of good quality and near the surface, is found over an area of 10,000 square miles, at a moderate distance from the coast, and on the line of the projected railway. Iron, also, exists in great quantities, mines of hæmatite, of good quality, having for years past been worked by the natives, while in the north there are actual mountains of magnetic ore. Lead and copper are also found in various parts, both associated with each other and apart, the former being now successfully worked at Marico, and mines of considerable depth affording proof of the latter material having been excavated by natives in times past. Diamonds at the south-western and gold in the north and north-east parts of the country have also been discovered, though not as yet in any very large quantity, and a cobalt mine, near Middelburg, has lately been opened, and it is said is proving a profitable speculation to the proprietors.

Owing to the heavy cost of land carriage, there are, however, few of these products that can be made available for export until improved means of transport have been provided. At the present time the staple articles of commerce are confined to such as, from their value, will bear these heavy payments, such as wool, hides, ivory, ostrich feathers, and cobalt.

It will be seen, from what I have said, that the Transvaal has within itself all that is required to make it a self-sustaining State. It is admirably watered over the greater part; the climate is good, and the seasons regular—the rains falling, as a rule, during the summer from October to April, and the winter months being generally dry.

A great portion of the country, and especially that at the higher levels, is, owing to its plentiful water supply and the quality of its soil, capable of supporting a large population, and thus affords a prospect of its being utilized, in course of time, as a field for emigration. The neighbourhood of New Scotland, in particular, with all the high

table-land along the water-shed, from Leydenburg, on the one side, to Wakkerstroom on the other, and, with the slopes leading east and west from that line, is specially adapted for English settlement. The greater part of it lies at an elevation of from 5,000 to 6,000 feet above the sea, dropping rather abruptly towards the coast, and inclining very gradually again towards the interior. At the summit it forms a great woodless plain, with lakes, some of fresh and others of brackish water, and of sizes varying from half a mile to ten miles in length. The absence of wood, however, is compensated in some measure by the coal which is found all over this region, and which is of very superior quality. Unfortunately, the land throughout the Transvaal is almost all held by private owners, and thus the Government will be unable to organize any extensive emigration, or provide for other public objects, as is done to other colonies through this means. The emigrant will therefore have to resort to private purchase in order to obtain his land, but for this, owing to the very large amount in the market consequent on over-speculation, there is every advantage in his favour, the present prices ruling far lower than are to be found in any other colony. Any systematic emigration, however, must depend upon the line of railway being constructed, as without a prospect of easy communication with foreign markets, there would be little hope of success in farming.

The Government of the Transvaal has, until the last year, been carried on under a Republican form, and virtually controlled by the Dutch emigrant farmers, or Boers, whose numbers, as I have before said, are about 35,000, and who thus stand in the proportion of seven to one of the rest of the white population. Owing in part to defects in the Constitution or the fundamental law of the country, to their want of education, and of acquaintance with the principles of political economy, but perhaps, most of all, to the absence of a competent leader, the administration of the country has for many years past been declining in efficiency, the result of which has been to bring it to the extremity which has ended in its collapse, and has made annexation, if not a necessity, at least a matter of easy accomplishment.

But it has had other and perhaps greater difficulties to contend with. Small in their numbers, compared to the mass of barbarism by which they have been surrounded, the energies of the people have been withdrawn from legitimate industry, and have had to be directed mainly to maintaining their authority over the black population, which has been surging in since their occupation of the country. With no other means of raising a revenue than from internal sources, and subject, not alone to a charge of from 10*l.* to 20*l.* a ton for the transport of all articles of foreign merchandize, but also saddled with the payment of heavy Customs dues to the Cape and Natal for which they got no return, it has been impossible for them to provide the means of carrying on an effective Government. On the other hand, every trifling lapse of justice or act of irregularity, though in general only the result of their weakness, has been visited on them in a manner to still further paralyze their efforts, and to strengthen the hands of their adversaries.

But notwithstanding these almost insurmountable drawbacks, a

steady advance, not alone in material prosperity, but also in civilization, was taking place. The old animosity against the English, dying out as the causes of irritation were forgotten or removed, the latter were gradually received into their counsels, and influencing their Government; and the time was being looked forward to when, with mutual goodwill and by a more natural transition, the change which has now taken place might have been effected. This result, it was also hoped, would have been materially hastened by the opportune discoveries, which caused an immense influx of British subjects from the Cape and elsewhere to the diamond fields, a portion of which were within this territory. It was felt that it was only by English migration that the population could be materially augmented, and thus that the question of the change was only one of time, and that, if left to the natural action of self-interest, the desired solution would follow in due course. To those similarly situated to myself, who were living in the country, and had every desire to promote its interests, the possession of the diamond fields was looked upon more as a burden than as a valuable acquisition; and if the population could have been separated from the glittering stones they would have gladly sacrificed the latter. But it was the population they wanted, and these were doomed to be withdrawn, and a policy entered on which has been the chief cause of all subsequent trouble.

The first effect upon the Government of the Transvaal of the measures then adopted by the English Colonial authorities in South Africa, and which resulted in the annexation of the diamond fields, apart from the distrust and aversion to the English which it revived or stimulated among the Dutch inhabitants, was that of weakening its authority over, not alone those whose cause had been espoused in order to sustain the claim to the land, but over the whole body of the native population within and adjoining the State. And this was not all, for at the same time firearms, which by Treaty with us the Boers were prohibited from selling to the natives, were here thrown open to the latter to an unlimited extent, and it is estimated that in a comparatively short period upwards of 200,000 guns were purchased by the natives living at the northern and western borders of the Transvaal. Earnest appeals and protests were made, but with no effect. The colonial revenues were profiting by it to the extent of 10*s.* to 1*l.* a barrel; and the guns costing in Birmingham 4*s.* to 5*s.*, selling at 6*l.* to 7*l.* 10*s.* each. It was perhaps natural that at the time those reaping so large a profit, and who were unaffected by the consequences, should raise no objection, and be deaf to appeal, but an estimate of the feelings of the Transvaal residents on the occasion may be formed by referring to the following extract from a Natal newspaper of late date, and written since the threatening aspect of affairs on their border have made the question of the sale of firearms to natives one of close personal interest to that colony. The editor says:—"We cannot find "words sufficiently strong to denounce the wicked cupidity of the "Europeans who can be so lost to all sense of right and patriotic "feeling as to take part in or connive at such a traffic. We do not "hesitate to say that any man who is privy to such transactions, or

" who directly or indirectly knowingly shares in the profit is guilty of " criminality of the deepest dye. Were their guilt to become known " it would be the duty of the whole community to shun and execrate " them." On this I will only remark that it can hardly be a matter of surprise, at least to the Natal editor, that the Boers should now shun, if not execrate us.

The troubles of their Government did not end here, for before the excitement and irritation which had been caused by these measures had had time to subside, further difficulties arose in the north. Thefts of cattle having taken place, and the delinquents being harboured by the chief Sekukuni, it became necessary to declare war against the latter, and here again for some inscrutable reason the cause of the savage is espoused—the war declared unjust and aggressive—and the chief to have the rights of a belligerent, British subjects residing in the Transvaal being at the same time prohibited by proclamation from taking part against him. This injunction, however, did not, I am happy to say, have the effect of deterring Englishmen from doing their duty there, as elsewhere, but by the moral support it afforded to the rebel chief it inflicted another severe blow on the country. These were some of the chief causes which led to the disorganized state of the Transvaal, in which it was found on the arrival of Sir Theophilus Shepstone at the commencement of last year. But there were other circumstances which also greatly influenced this position. The war with Sekukuni had been entered on without preparation, and on a far larger scale than is suited to the patriarchal Boer system. Without any knowledge of military matters, the President had constituted himself chief, and had taken personal command of the expedition; and after many months of fighting found himself not alone unable to penetrate the almost impregnable natural fortresses in which the chief protected himself, but also reduced to great scarcity both of food and ammunition. In almost absolute want, or receiving uncertain supplies of these necessaries, it was but natural that in the end confidence in him should fail. Disaffection thus soon showed itself, and before long open defiance.

As the summer season was now about setting in, bringing with it the annual horse distemper, the volunteer army summarily dispersed and retired to their homes, arranging among themselves to return before the following harvest, when the native crops, which were grown on the plains, would be exposed to capture; and thus that though unable to follow their enemy into the caves, they would endeavour to defeat them by starvation. This movement on their part was at once taken up and commented on by adverse newspaper and other correspondents, who not alone magnified it into a defeat, but also falsely represented that Sekukuni was in full pursuit of the flying army to Pretoria. This was also the tenor of the misleading telegrams to England, which to all appearance were the immediate occasion of Sir Theophilus Shepstone's mission.

The President's term of office having also now nearly expired, and a new election being about to take place, the country had, in addition to its other complications, then to decide on the choice of a successor; a

matter upon which the people were on this occasion more than commonly divided. It was at this particular juncture that the British Commissioner, leaving a large body of troops near the border, entered the country and took up his residence at the seat of Government. Meanwhile rumours were in circulation, that peaceably if possible, but if necessary by force, annexation was intended. The English or European inhabitants who preponderate in the towns flew to the standard, and the President himself offering no rallying point, opposition was disarmed and annexation became easy. The apparent apathy or indifference of the Boers on the occasion of this singular assumption of their Government by a foreign power is thus to some extent explained. They had been taken at a disadvantage, the imminence of the dangers that surrounded them exaggerated and dwelt on until they themselves seemed almost to believe in their reality, and in the end they surrendered to what they were told was "the inevitable."

At the crisis considerable anxiety was felt as to the result, and much fear was entertained that hostility with the Boers would be provoked; the relief was therefore also much appreciated at the peaceful termination of the proceeding, and great credit was given to the Commissioner for the management he had displayed; while those who regretted the necessity or condemned the policy of his action seemed too thankful to allow themselves to hamper him with futile expressions of dissent.

In endeavouring to convey an account of the causes which led to the annexation, and the manner in which it was carried out, it has not been my object to dwell upon the grievances of the Boers more than is necessary to enable us to form an opinion as to the feelings which they, who constitute the great majority of the white population, may be expected to entertain towards us, and as to the measures, if any, which it is necessary to take in order to induce their harmonious co-operation with us for the future. And I have also desired to take this opportunity of protesting against the habit of looking upon the annexation of the Transvaal only with feelings of gratulation or pride,—and referring to a sturdy Englishman and twenty-five policemen having effected this object without so much as saying, "By your leave,"—and not taking into consideration what were the causes that led to the weakness and demoralization of the Boer Government, or what the responsibilities which have now been undertaken by our own.

A deal of obloquy has been thrown upon the Boers, emanating chiefly from those who were endeavouring to bring about the fall of the Republic. Speculators who hoped by the substitution of British rule that their lands would rise in value, besides a large portion of the colonial press and others, were engaged in systematic misrepresentation to bring about the desired end. Even in the published blue books on the subject, we find pages taken up with anonymous letters and newspaper articles giving exaggerated accounts of the defencelessness and distress of the white population, and at the same time, with palpable inconsistency, of their tyranny and oppression of the blacks. A long correspondence also appears on the subject of the use of explosive bullets, and of the massacre of women by the Boers; and notwithstanding the refutation of these charges, and the entire absence

of evidence to support them, the stigma has most ungenerously been allowed to remain.

But the Boers are not all the monsters they have by some been represented. Fortunately for them, their country has of late been visited by two eminent writers, who both bear testimony, without disguising the harsher features in their character, to those that do them credit, and both tend to show that whatever their defects may be, they are but the result of the circumstances which for generations have controlled their lives; and also that these are, to say the least, no greater than characterize those who have been similarly placed in other lands. It is my own feeling that instead of condemning them, as is often done, for faults which owe their origin chiefly to their long isolation, they should have every praise for having kept themselves as free as they have done from the contaminating savage influences which have for so long surrounded them, and that Englishmen at least should not forget in how far they may be due to the effects of British rule or British neglect.

Having now occupied so much time in treating of the Boers, a few words will, perhaps, suffice to allude to the remaining portion of the white population. These have been estimated at about 5,000, and are composed chiefly of home and colonial born British subjects, with a few Dutch, German, and other foreigners. This body, though small, exercised considerable influence under the late Republic, owing to their generally superior education and progressive tendencies. It is from their ranks that, as a rule, all departmental offices of Government have been filled, and by them that the trade of the country is chiefly carried on. They had also of late been elected in increasing proportion as members of the Legislature, the Boers preferring as much as could be to devote their attention to their own more congenial pursuits, and thus the former were gradually acquiring an important control over the affairs of the State.

The native population has always been estimated at from 250,000 to 300,000, though in the reports of the present Administrator I find that he considers the number who are legally subjects of the State, and which I conclude must be taken to mean those who live within its acknowledged limits, to be no less than 800,000. No census, however, has at any time been taken, nor do even any approximately accurate data exist, as far as I am aware, for calculating them; the first-mentioned estimate of about 300,000 being, I believe, the result of guess-work of missionaries and travellers. Upon what the later calculation has been based I have no means of ascertaining, and though I should have thought this estimate excessive, yet the position of Sir T. Shepstone entitles his opinion to much weight. The native population, however, whatever its numbers may be, consists of various small tribes, the great majority of whom occupy the country near the northern and western borders. As has been the case in Natal and the Orange Free State, the security to life and property derived from the presence of the whites has caused a vast accession to the black population by migration from the countries exterior and adjacent to it. In Natal the British Commissioner, who was sent up to annex on that

occasion, reported the number of natives in 1843 to be about 10,000. It has since then, under British rule, advanced to upwards of 300,000. In the Orange Free State, Moshesh was, in 1840, an insignificant chieftain with a small following, and glad to shelter himself under the Boers, though but a few years later he was able to defy the British troops, and afterwards to cause infinite annoyance to those under whose protection he had gained wealth and strength. So also in the Transvaal. When Moselikatse fled before the Boers in 1836, he left the country almost denuded of inhabitants. The father of Sekukuni had previously been driven out of his fastnesses by him, and the remaining small tribes who had been the dogs or slaves of the great chief, were glad to acknowledge their subjection to, and accept the protection of, the Boers. Gradually, however, by the return of individuals to existing tribes, as well as of whole clans who had been expelled by Moselikatse, these also have gained in strength. Of the latter, the Chief Sekukuni occupies perhaps the position of most prominence, as fortified by the natural strongholds to which he had returned, and by the possession of firearms before alluded to; it was the war with him which was the immediate cause of the collapse of the Republic, and it is he who is now occasioning alarm to the present rulers of the country. The natives of the Transvaal, though forming a large aggregate, are more divided into separate nationalities than in Natal or near the Cape; and for this reason they do not constitute so great an element of danger. To keep them thus separate, and to avoid giving rise to combinations either from motives of political interest, or for the purposes of war, will, it is to be hoped, be the endeavour of the present Government, as it is only by this means that in the absence of a large military force, or until the white population is greatly increased, we can look forward to any permanent peace. Large masses of natives, as they are found in South Africa, have always been a serious bar to the progress of the colonies they inhabit or adjoin. It is not only their savage restlessness and their proneness to war, by which such colonies are periodically thrown back so many years, as to leave them practically at a stand-still, that constitutes their disadvantage, but it is that their presence always necessitates a heavy increase in expenditure, for which they cannot or do not pay their due share; and that owing to their idleness they do not form an element of wealth as a European population would do. Of the natives of the Transvaal, however, it may be said that they are less warlike and thus less a source of danger, and have in themselves more aptitude for civilization, than any of the tribes in and adjacent to Natal or the Cape. They are more ingenious, imitative, and progressive than is the Zulu; though, on the other hand, perhaps more openly untruthful, and flagrantly dishonest; and, in short, there is in these respects but little fear of their suffering much from the contagion of civilization. They also show a greater desire to accept Christian teaching than do any of the other native tribes; and it is a singular fact, and one well worthy of being noted, that notwithstanding the well-known opposition of the Boers to missionaries, it is only among the natives here, or those on the western border, that Christianity is tribally professed, and that a

desire is shown to adopt European clothing and habits. The Boer has a contempt for the heathen worthy of the Israelite of old; he almost denies him the possession of a soul, and tells him that the skin he wears is too good to cover him, and yet whether it is owing to his spirit of contradiction—to his imitative nature—or whatever the cause may be, it is among these alone, of all the South African tribes, that the native encourages and supports the missionary, and with the creed affects the clothing, habits, and even language of his civilized invader. In the English colonies we have to make laws to compel the natives to cover their nakedness on entering the towns; we offer every encouragement to missionaries, who on their part lay before them every kind of inducement to take up the profession of religion, and we only succeed in repelling them. The natives seem to suspect a sinister design when such persistent efforts are used to make them accept what they are at the same time told it is a privilege to have, when, in fact, it is made too cheap to them. And here I would ask whether it is not, perhaps, in this very fact that much of the evil lies which has brought about the disrepute so often attached to missions, and to their so-called converts. That the latter, as a class, do not enjoy a good name cannot be denied; with the Boers the dislike to them is universal, and the English colonist also points to the rebellions that have had their rise among them, to the gaol returns, and to the open immorality at their stations. It is, however, a tender subject to speak upon, as Lieutenant Cameron found to his cost at the meeting of the Geographical Society; but it will not do always to evade the question, for there is certainly something radically wrong, both in this and as regards our system of dealing with black races generally; and if we wish to ascertain where the evil lies, or what the remedy, we should not, as was done in his case, content ourselves with flat denial.

Baron Hubner, in his "Promenade Autour du Monde," after passing a high eulogy on the English as colonizers, bears strong testimony to their failure as compared to the Spaniards and Portuguese, if, as he says, colonization means carrying civilization into the heart of a native population. "Wherever the Spaniards have reigned," he says, "we find Indian tribes who have embraced Christianity, and adopted "in a measure our habits and ideas. The greater part of the politicians whom we see at the head of the Republics are of Indian "origin. I have had pure red-skins as colleagues, and I have seen "ladies of the same colour dressed by Worth delighting in Patti's "*roulades*. I do not quote these personages as models of statesmen, "or these fair critics as great authorities in music, but the fact is "none the less significant. Well, this is the work of Spanish colonization. Can we say the same of the effect of English emigration? Evidently not. I set aside all question of India, which "I have not yet visited. But everywhere, especially in North "America, the contact of the Anglo-Saxon race with semi-barbarous "savages is fatal to the latter. They only adopt European vices; "they hate and fly from us, and that is the wisest thing they can do, "or else they perish miserably. In every way they remain what they "have always been—savages."

In South Africa, or rather in Natal, it has not been the case that they have perished miserably—they have too much vitality for that—but though they have not done so, we have everywhere failed to make contented subjects of them, or materially to improve their condition. In the Portuguese settlements in Africa, that I have seen, the European seems to be welcome to the savage. They work along happily together, and civilization diffuses itself among them, it may be slowly, but yet by an apparently easy and natural process, and without any of those shocks which occur with us. So also with religion. They do not proselytise and preach as we do, nor do they offer material inducements in any shape, but their church door is open, and they are ready and willing to teach when required. The result is that their chapels are full, and that, when they do make a convert, he is a sincere one.

On the other hand, the system which has prevailed at many of our missions is one that could not but be productive of much evil. By allowing the free use of land on the stations as the reward, so to say, of church attendance, the effect has been to encourage, not alone idleness, but hypocrisy. While, by debarring them from acquiring an interest in the soil, through the possession of landed property, and, by keeping them as tenants-at-will, and thus in a state of dependence or virtual vagabondage, the result has been but too often to make of them discontented and rebellious subjects.

Another evil connected with large mission stations as they have existed, as well among the native tribes as in the civilized parts of South Africa, is that of the segregation of a class in the community. Separated in feeling, as well as in position, from their non-professing brethren, and, in general, assuming to be their superiors, they acquire separate interests, and, by their numbers as well as their unity, become a source of danger. The missionary, too, in such cases, in his joint capacity of proprietor and priest, obtains over the people, and through them in the State, an amount of influence which, as has been proved in times past, is liable to much abuse. Other circumstances may also affect the character of different missionary stations, and which arise from the mode of teaching or, it may be, of the doctrines taught, for at the one you will meet an honest cheery-looking lot, who are glad to see you and will salute you with respect, and, at the other, a sullen scoundrel, who seems at once to put himself on the defensive, lest you should be deceived into thinking you were as good as he; but of these matters it would not do to say too much. What I have mentioned are however, I believe, some of the chief causes of the unpopularity and disrepute in which missions have been held, and which have excited the distrust and jealousy of the civilized man, as well as of the savage.

The Transvaal, with the population such as I have described, and with inherent wealth to entitle it to rank as a valuable possession, has now passed into a British dependency, and it is with these materials that the foundation has to be laid for the establishment of a Government, and by them that its future destiny will be controlled. The questions as to the form of government that is to be introduced,

and as to the means by which this new acquisition is to be utilised and the country to be made self-supporting, are, I have no doubt, engaging the attention of those in authority, but I confess to being somewhat sceptical as to their receiving an early or a satisfactory solution. If the Boers, who form seven-eighths of the white population, should continue, as I trust may not be the case, to maintain their present attitude of passive resistance, it would, of course, be folly to suppose that there can be any continuance of the self-governing powers that prevailed prior to the annexation; and thus that, unless some measure is devised for securing their good-will and co-operation, there will be no other alternative than that the responsibility of its government should fall upon the Crown alone. This, however, is an issue which is at variance with the promises made on taking over the country, and I should therefore think has not hitherto been contemplated or provided for by those concerned in the annexation; neither, I imagine, was it anticipated that the new colony should for long remain a burden on the home country, either for its administration or defence.

It may naturally be expected that after having so far made a display of all that seems adverse to a solution, I should myself be prepared to indicate a line of action by which the difficulties could be met, and the various interests in some degree united. But without a knowledge of the ultimate views which have dictated the policy thus far, or of the means available for carrying them into effect, it is impossible for me to do more than touch upon such matters as to myself may appear important, though they may in effect be but superficial as regarded from another stand-point.

Before going into the consideration of the question I have here mooted, namely, that of the means by which harmonious co-operation among the white inhabitants is likely to be promoted, I think it is necessary first to enquire as to another which is of equal, if not prior, importance—that of revenue.

One of the chief difficulties of the Transvaal has hitherto been that of obtaining a revenue sufficient to provide the machinery necessary for its effective government and defence, arising from the absence of that which in most countries is the chief source of supply, viz., Customs duties; and this difficulty must inevitably continue until such time as the white population is increased, and its mineral and agricultural resources can be utilised, or until taxation of the native population can be enforced. At the present time, without markets for their produce, and having to pay heavy Customs dues, which are expended for the benefit of the neighbouring colonies, it is impossible to expect that a population numbering at the utmost 10,000 adult men can provide the means, not only for their own personal government, but for the control of 800,000 blacks, and for the defence of a border of 1,200 miles.

This great want may in some measure be met by requiring the Cape and Natal to refund the proportion of Customs duties obtained from imports destined for the Transvaal; but this is a concession which has hitherto been resolutely denied, and even should it be eventually obtained through Imperial pressure, considerable time must elapse

before it can be made available. The expenditure of the country, on the other hand, has also now materially increased, owing, not alone to the military occupation which has become requisite, but also to the necessarily extended machinery of government required by British rule. Formerly many services were performed gratuitously, such as apprehension of criminals, police duty, &c., but this system being liable to abuse either has been, or soon will be, discontinued. The late Government being limited in credit, as well as in means, were bound to cut their coat according to their cloth; and a necessary consequence of this poverty has been that crime often remained unpunished, and that irregularities occurred on its distant borders, and collision with natives which have from time to time brought upon them the thunders of Exeter Hall. As an instance of this I may mention that I recollect on one occasion the Government being goaded into an expenditure of 2,000*l.*, or what was then one-tenth of the annual revenue, on a single prosecution, in order to satisfy the demands made by the Colonial Office under the influence of such pressure. But it is unnecessary to go into further detail, for from what I have shown I think it will be sufficiently evident that if the defects of the previous Government are to be remedied, and the peace of the country permanently secured, it must be by the exercise of Imperial authority and with Imperial means.

Before reverting to the subject of the Boers, I wish to draw attention to some matters involved in the act of annexation itself.

The main or ostensible object of that measure—setting aside the under-current of pressure brought to bear on the public mind by the Humanitarian Societies at home—has been to secure the peace of that and our adjoining colonies, and has, I conclude, been based to some extent on the assumption that "the reputation of British rule stands "high with all the tribes, and that they would hail its introduction as "a positive blessing;" and to quote further from the same despatch, written prior to the annexation, "that we have paramount influence "with the most warlike of the native powers outside the Transvaal "boundary, and that the position of the two most likely to give "trouble—the Zulus and the Amaswazi—is such that the possession "of the Transvaal by Her Majesty's Government would at any "moment checkmate them both."

Now, I say in regard to the first that the reputation of British *power* may stand high, though I do not admit that its *rule* does so; but I argue from the very fact of the higher estimation in which its power is held, that the Zulus and other tribes, finding themselves thus surrounded, would have greater cause of apprehension, and thus be far more likely to make a common stand than when confronted with a power they did not so much fear. And, on the other hand, I cannot see that the control we would have over the Zulu nation (for the Awaswazi, being old enemies of the latter, cannot be classed with them here) would be insured by indefinitely extending the line requiring protection. The past history of the Cape does, at all events, not tend to encourage the belief that the predictions here held out would be verified. Facts are, however, now taking the place of surmise and argument, for we find that both the Zulu King and the Chief Seku-

kuni are assuming to-day towards us the same attitude which they had previously taken up towards the Government of the Republic. The course which events appear now to be taking show in fact only a repetition of the story told by Sir George Clerk, and which I quote from a very able article in the *Quarterly Review* for January, 1877, on British policy in South Africa. Writing as High Commissioner from the Cape in 1854 on the "motives and history of the successive acts "of territorial extension in that colony," Sir George says: "One of "the reasons for extending British dominion in South Africa has been "to prevent the extinction of the rights of the natives. The know- "ledge that the British dominion has been thus enlarged proves "acceptable in England. The extension manifests our power, the "motives our benevolence. After a while the measure becomes costly. "Enquiry follows; and then it is evident that the conquest has been "the mere occupation of wastes, almost uninhabitable, attended with "constant inconvenience and dangers to the State, arising from "nothing less than the extinction of the rights of the natives, to "protect whom was the pretext of the extension of our authority."

When these native rights, whatever the expression may be taken to mean, were lately placed in antagonism to those of the Boers—the latter tried on their part, but unfortunately have failed to extinguish them. We have now succeeded in effacing those Boers' rights, and everyone who is not disloyal must now devoutly hope that the brave men who are serving their Queen out there will enable us to repeat the operation upon the Chief Sekukuni, and, if necessary, upon the Zulu King also, "to protect whom" (if I may be excused the repetition) "has been one of the pretexts of the extension of our authority."

I now return to the question as to the mode in which the mixed population is to be governed, and how their interests are to be reconciled to our rule, which to use plainer language means, is it necessary, and if so, what is it advisable to do in order to lead the Boers to abandon their present sullen attitude, and to accept, in the spirit in which it has been meant, from England at least, the hand which has been held out to them? From what I have said at the commencement it will be seen that the grievances of the Boers are of old standing. To quote again from the article I have before mentioned, Sir George Clerk, writing to the Duke of Newcastle in 1853, says: "Your "Grace is no doubt aware that in reviewing the former policy of the "British Government one cannot escape from the painful conviction, "with reference to the interests and feelings of the Dutch inhabitants "of the Cape Colony, that the measures which, with few exceptions, "it has pursued towards them, and the neglect or disdain with which "it has habitually regarded them, have engendered a spirit which "leaves them by no means desirous of remaining under British "dominion." I have mentioned what has taken place with regard to them subsequently to that time, and I think it will be admitted that since to that neglect or disdain have been added the overt action I have attempted to describe, it cannot be expected that their feelings towards us will have improved in the interval.

But notwithstanding the strong reasons we have given them for

their aversion to our rule, I do not by any means despair of their being brought round to a better feeling, provided the desire is properly manifested on our part. The Boers are, as Mr. Trollope remarks, a grateful people—often indeed thankful for very small mercies. The slightest attention or civility on the part of those in authority is keenly appreciated, and when it occurs, becomes a theme of continual praise. So also on any of those occasions that any act of otherwise than supercilious kindness or sympathy has been performed towards them by a neighbouring colony or Government; and, in spite of all that has happened, there still lingers with them the conviction that England's Government and England's Queen are great and good. But what has in the past, and does still rankle in their hearts, are the acts of injustice or contempt from which they have suffered—at the instigation of, it may be, a colonial official—or of a pseudo-philanthropist at home. The manner in which Lord Carnarvon's general colonial policy has been received by them is an instance of this, for their appreciation of his sympathy, and of his efforts to harmonise the different provincial interests in South Africa, has been sufficient to sustain their feeling of admiration and respect for his person in spite of their aversion to the measures he had of late been led to adopt with regard to them personally. The main point of difference between the Boers and the Government of England as it has hitherto been administered in South Africa, and one upon which they have the sympathy in a great degree of their English fellow colonists, is that of native management. It is the question that has been at the root of all their discontent, which drove them from the Cape, afterwards from Natal, and now has brought about their political collapse. But here I apprehend there will be some difficulty in obtaining a practical or a dispassionate consideration of the matter—for it is also one upon which those who are totally unaffected by its results, except as a matter of sentiment—will claim to have a voice in the decision. Past experience has shown that a colonial question of this nature—unless it involved a point of home interest—would in all probability, when brought before Parliament, have the effect either of clearing the House, or it would be controlled by those who have constituted themselves the champions of savagedom, and whose proceedings in this respect have caused more hostility between the races and more permanent injury to blacks than I think can be traced to any other special cause. It is therefore much to be feared that the definite settlement of the question will not be arrived at until those most concerned in its effects are in a position to act independently of such control.

The first and most essential point to be determined is as to whether we have any right in the country of the savage at all; and it is one upon which, though practically decided long ago, there is still a want of absolute concurrence of opinion. In taking possession of such land we have, as if it were with the desire of avoiding the admission of an apparent injustice, always tacked on a high and beneficent motive, conveying, it may be said, the further admission that, but for that motive, the act would be unjustifiable. In a similar course, one by

one, each native right is extinguished, but always again with a preamble in which the motive excuses the act. Now the Boer arrives at exactly the same result, but by a much straighter cut—or, I should rather say, he commences about where we end—which is in saying that when they meet, the savage has to go to the wall, that is, that the right of the latter to govern, and *his* right to the soil, ceases or becomes subordinated to the will of the superior. It may be that, after this stage, we can lay claim to rule with greater lenity, or what it pleases us to call justice; but this is mainly due to the knowledge of our strength, for it is that which enables us to be generous. Severity on the part of the Boers towards the natives has been in a great measure only the necessary result of weakness, and it is only with the removal of that weakness that the evils incident to it can be expected to disappear. This has received a recent illustration in the measures it was found requisite to adopt in Natal, in order to subdue the rebel Chief, Langalibalele.

If, then, we are agreed thus far, the next question is as to the position which we should assume towards the aboriginal barbarian. Our policy in this respect has never been defined or consistent, and consequently often both irritating and distracting to the natives, who are much puzzled to follow the thread of our principles through the maze of the alternate toleration of liberty and of licence, the acquisition and abandonment of territory, and the punishment or otherwise of different forms of vice. This also is the question upon which, not only the future goodwill of the Boer is almost wholly dependent, but the welfare and happiness of the native himself; and I will therefore venture to say a few words upon it, and to state, as far as I can, what the measures are which a colonist, whether Boer or English, desires.

In deciding upon the future management of natives in the Transvaal, the circumstances of the Cape, as they are in no way analogous, do not afford us much guide, and the example furnished by Natal is only of advantage as showing what should be avoided. In the latter there has, indeed, been no policy except that of inaction, and the perpetuation of native customs, native laws, and native autocracy. It has simply been the substitution of a white chief in the place of a black one; and a system which, as it was almost wholly dependent upon the ability or tact of an individual, could have no permanence or succession. With the exception of a very small number, the natives of Natal are all refugee Zulus and their offspring, and are regarded by the Zulu King as his renegade subjects, and it is to the fact of his near neighbourhood that Natal is mainly indebted for the immunity from insurrection which she has so long enjoyed. Since the late rumours of Zulu disturbance it has, I see, been proposed in a leading Natal paper, that that chief's country should also be annexed, in order to put a stop to the trouble which his threatening attitude so often occasions; but I trust these counsels will not be followed, for to do so would be to produce a unity of interest among the Zulu race which might be most prejudicial to white supremacy.

To return, however, to native management in the Transvaal. It is my opinion that, assuming that we have decided the question of our

right to be there in the affirmative, the next step is to declare that we have a right to rule and to control the savage; and, further, that it is our duty so to control him, as to wean him from his barbarous habits, and incline him to those of peace and industry. In his state of tutelage he should not be consulted any more than a child would be; he has to be *ruled*, with justice, of course, but also with firmness, and we should not omit to demand from him the same unquestioning obedience to authority to which he is used. If we do not adopt this principle, it would be far better for him, as well as for ourselves, that we kept away from him. We should also compel him to pay his fair proportion towards the maintenance of the Government, and not only with that view, but also with the express object of making him work for his taxes, and thus keeping him from idleness. Some who have lately written on the subject, and other kind sympathisers at home, see no reason why Kafirs more than other people should be required to work if they can live without it; but they do not, perhaps, reflect that idleness in the savage does not mean the same as in the civilized man. I doubt if either can be absolutely idle; but I know that the tendency of the savage, if not at healthy labour, is to do mischief, and for that reason, as well as to make him a more useful member of society, I should use all reasonable means to force him to work. I know it will be said that I want to annex his labour, and thus that my motives may be suspected; but here I am quite content to rest in the company of those who have carried on a somewhat similar operation, though on a much larger scale. Neither is sufficient importance attached to the fact that the presence of a large native population, most of whom have come into the country since the occupation of the whites, not only necessitates an increased outlay for their control and government, but also has the effect of preventing the importation of labour from England.

It is on the principles involved in these questions that the Boers, as well as English colonists, have ever been at issue with Imperial authority, and upon which depend all future relations.

There may be much in the Boer system to be reprehended, but in part of its theory it is undoubtedly correct. It is more direct and consistent, and thus less liable to distract and irritate the native than our own. When the former come into contact they understand one another then and there, and if an encroachment is made it is over at once. With us, though the process is more gradual, the encroachment is not the less sure. It is my belief that the right line lies between the two systems, and that if we will only accept as a foregone conclusion what experience shows is the inevitable result of our contact with African natives, and take upon ourselves boldly the position and the responsibilities to which we are entitled and bound, the future rule will be productive of more happy results to all concerned than have been obtained in the past. The problem has in any case now to be worked out in the Transvaal; with a material perhaps more favourable to deal with; but also upon a far larger scale than has hitherto been known in Africa; and the effects for future good or evil will mainly depend upon the manner in which the commencement is made.

One more word before concluding. I have already mentioned the

difficulties that will exist in raising a revenue sufficient for the proper government of the country, arising from the smallness of the white population, and the absence of facilities for the export of produce. To remedy this evil there is but one course open, which is, that a line of railway should be constructed from Delagoa Bay. The Portuguese Government have signified their willingness to undertake their portion, and had entered into a treaty with the Republican authorities by which they allowed the Transvaal a remission of duty almost amounting to free transit, and all that is now required is that our Government should undertake to extend the line from their boundary in the first instance for about forty or fifty miles, which would bring it to a central spot within the eastern frontier. For this distance the line is almost level, and crosses only two small rivers, so that the expense would be comparatively trifling. But there are other reasons why this important work should no longer be neglected. A pledge was given in the proclamation of annexation that all contracts entered into by the previous Government would be maintained, and it is to the apparent lapse or non-continuance of the arrangements which had been made to carry it into effect, and to the fear of Natal influence prevailing to deprive them of a long-hoped-for benefit, and cause a sacrifice of their interests to its own, that much of the present discontent in the Transvaal is to be traced.

The proposed railway is, however, of such vital importance both in regard to the financial interests of the country, and to the advantages it will offer in case of any necessity for military operation in the rear of the Zulus, that it would be wrong to suppose that any but the most serious objections will be allowed to delay its execution.

Mr. DONALD CURRIE, C.M.G.: I have listened with much pleasure to the lecture with which Mr. Moodie has favoured us. I know Mr. Moodie very well, and every one acquainted with South Africa must be aware of the deep interest which he has always taken in the development of the country. I suppose no one living in the Transvaal has traversed the territory to a greater extent in order to discover the best means of communication. Mr. Moodie, with the late President, Mr. Burgers, made the arrangement for transferring the railway concession which he had got from the Portuguese Government from Delagoa Bay to the boundary of the South African Republic. At that time the President went with Mr. Moodie to Portugal and received from them a new concession for the line of railway, and also there was a treaty of commerce; but owing to the annexation we are now face to face with a great difficulty. I do not see where the capital is to be found, or where the revenue is to come from which is to make it safe to undertake the construction of an extensive line of railway. I see very clearly the immense advantage of such a railway to the Transvaal. I should like to ask Mr. Moodie whether it is true that the Portuguese Government have withdrawn their promise to establish a railway; have they agreed to construct it, or are they only promising that if the capital is provided up to their boundary, they will subsidise it?

Mr. MOODIE: That is all.

Mr. DONALD CURRIE: Has there been any change in the mind of the present Government in Portugal as compared with the late Ministry?

Mr. MOODIE: The same Ministry exists now; they have returned to power.

Mr. DONALD CURRIE: They were extremely favourable to the line of railway before Mr. Burgers gave up the Presidency, and we all know that the Republic made some arrangements with the Cockerell Company of Belgium with a view to laying down a railway. Since that time I understand that Her Majesty's Government have not seen their way to undertake the responsibility of carrying out the project

of the Cockerell Company. Where is the capital to be got to form the line of railway? If we could get the line of railway established and that country opened up, there would certainly be developed immense resources for the benefit of mankind. But what sort of assistance would the Government be required to give to enable it to pay? No doubt the country is boundless in its natural wealth; it has mineral, agricultural, and other resources of the most plentiful character, but the line of railway is necessary. The difficulty appears to be that it would have its terminus in a foreign port. At Delagoa Bay we have forty feet draught of water, while at Natal we cannot pass the bay with our steamers drawing ten feet, and a very large sum of money will have to be expended to make Durban a serviceable port. No doubt the great secret of the dissatisfaction in the Transvaal at this moment is owing to the fact that the people interested are in doubt whether they are to have the line of railway. I went to the Government with Mr. Paul Kruger, and the other Delegates from the Transvaal Boers. They returned to South Africa satisfied with the kindness shown to them by Lord Carnarvon, but the people who sent him here are not satisfied. Unless some satisfaction is given to the inhabitants, either in material assistance or otherwise, there may be difficulties which I think Mr. Moodie comprehends very well. Then come the relations with the colonies as to taxation for traffic which passes through. A percentage is charged by way of duty on importations, and as there are no means for establishing Custom-houses along the frontier, if drawback is to be got, it is not easy to arrange a bonding system at present. The Boers do not like direct taxation, and the difficulty is how money is to be obtained by way of revenue. Is there any enlightenment to be given on these points by those who know by personal knowledge, as Mr. Moodie does, what has been occurring in the Transvaal? Those are the points which occur to me. The great want for South Africa is white population. If people get out there, there is plenty of occupation; but when they arrive, they are confronted by an inert and idle Kafir population. There is no question as to the Transvaal being one of the richest countries in the world. The wheat grown there is equal to South Australian wheat, and the mineral resources of the country are boundless. I should like to have some practical statement from Mr. Moodie or any one who can say what is to be the outcome of this question of the establishment of a railway, for the development of the country requires it.

Colonel HENRY CLINTON: I should like to ask whether the Governor is aware that he can do that which you do in private life: when you have property that you cannot get at, you are apt to go to a lawyer and ask him to negotiate a private loan. Is that possible in this case?

Mr. SANDERSON: I, for the most part, agree with the paper which Mr. Moodie has read. I consider it a most valuable contribution to the subject to which it relates, and, as Mr. Donald Currie has suggested that I should say a few words on the subject from a Natal point of view, I will endeavour to do so. There are a few points that struck me in Mr. Moodie's paper on which, as a resident in the colony of Natal, I may be able to put the facts, perhaps, in a somewhat truer light. Mr. Moodie says the Transvaal has no return from Natal nor from the Cape, of a large amount drawn by those colonies in the shape of Customs duties. I would beg to remind Mr. Moodie that Natal keeps up good roads at a very heavy expense. It has already spent not very wisely, but it has spent 200,000*l.* in the improvement of its harbours, and is now engaged in making railways at great expense. In all these advantages the Transvaal participates, and, therefore, to a certain extent, at all events, it is a *quid pro quo* for the Customs duties that are claimed. Mr. Moodie told us that when Her Majesty's Commissioner went to Natal in 1843 he reported the natives to be 10,000 in number. That is correct, but at that time the Commissioner had no means of knowing the real number of the population in the remote parts of the colony, and a more correct estimate was to place it at 100,000. There were 80,000 to 100,000 natives at the time the country was taken possession of by the English Government, and the large increase which has taken place since, is due partly to natural increase and partly to the return of tribes who had fled before the conquering Zulu, and to a very considerable extent, I admit, to the cause which Mr. Moodie spoke of as being the sole source of increase, namely, an influx of natives from surrounding territory. It is only fair that those other facts should be borne in mind,

because a very unfair impression is apt to be conveyed by the idea that the native population has increased under British rule from 10,000 to something like 300,000 or 400,000. As regards the segregation of the natives in Natal, and the dangers to be apprehended from that, I entirely agree with Mr. Moodie. I think that has been the source of much of the trouble we have in Natal, and will be, perhaps, more remotely, less directly, the source of the troubles that are now threatening us in the Transvaal and the Zulu country. The question of firearms has been referred to by Mr. Moodie, and with what he said on that subject I perfectly agree; but I would ask any intelligent audience whether it is a thing creditable to an English Government that their sole representative in the Zulu country should be the man who is importing at the rate of something like 10,000 stand of arms every year for sale among the natives? That is the fact, and it is well known to the Natal authorities, and yet they either will not or dare not dismiss that man and put another man in the position of their representative in the Zulu country. Mr. Moodie spoke of Sekukuni, and here it strikes me he was somewhat inconsistent, somewhat at variance with himself; he spoke of the Boer Government declaring war against Sekukuni. Now, a State does not usually declare war against its own subjects; it may treat them as rebels, but it does not declare war against them. The Boer Government did declare war against Sekukuni, and yet professed to regard him as a rebel. Now, Lord Carnarvon has expressed his conviction that the Boers had no right to regard Sekukuni as a subject, and, therefore, no right to treat him as a rebel. That opinion I had previously arrived at for myself from the most careful investigation I could form. The treaties upon which the Transvaal Government professed to found their authority over Sekukuni were simply in Lord Carnarvon's opinion and in my humble judgment, waste paper, and I very much fear that the same thing will be found to be the case with regard to the treaties which are alleged to subsist between the Zulu people, with whom we are now threatened with trouble, and the Transvaal Government. I am not in the least degree surprised that those troubles should now be threatening, because for twenty or twenty-five years Sir Theophilus Shepstone, as representing the head of affairs in Natal, has been supporting Cetewayo and his father, the former King, in their position with reference to the Transvaal Boers. The Transvaal Boers have been represented as encroaching year after year upon the Zulu country, and the Natal Government, of which Sir Theophilus Shepstone was, in regard to native affairs, at the head, appears to have supported the Zulu King in the position he assumed. But, no sooner is the country annexed and become English territory, than Sir Theophilus Shepstone, in my opinion, takes up the very position which he had condemned when assumed by the Transvaal Government. I ask whether it is to be wondered at, that Cetewayo the Zulu King should resent that and feel perplexed. No wonder he is arming himself at every point against what he fears to be an encroachment on the part of his former friends the English, or rather I should say he no longer regards Sir Theophilus Shepstone as an Englishman. He therefore looks to the Natal Government and the Queen for the maintenance of that support which he formerly received from Sir Theophilus Shepstone. I scarcely agree with Mr. Moodie with reference to the native population of Natal not being contented. I think the fact that something like 15,000, or at the very outside 20,000, white people have been living in the midst of 200,000 or 300,000, or as it is now said sometimes 400,000 blacks, and that there has been comparatively little crime of any kind either against property or life among that native population, shows that they are more contented than Mr. Moodie appears disposed to allow. That the feeling among the natives is less satisfactory now within the last two or three years is a lamentable fact, and to my thinking it is not at all to be wondered at. Mr. Moodie referred to the affair of Langalibalele, and without going into that very long and complicated question, I think there were circumstances connected with that which probably account for the feeling of alarm and distrust with which the natives in Natal are now disposed to regard the Government. That the natives generally in the very remote parts of South Africa are inclined to regard British rule as a blessing is an unquestionable fact. It was only a few years ago—a year or two before the Langalibalele trouble broke out—that messengers arrived from nearly all the more important native tribes from a great distance beyond the Transvaal country asking to be taken under British protection.

I think I had it on the authority of Sir Theophilus Shepstone himself that a very large proportion of the tribes beyond the Transvaal asked to be taken under British authority, and if there is any change in their feeling now towards the English, it will be from such causes as those to which I have adverted in the case of Sekukuni and Cetewayo the Zulu King, that the policy of the English Government has changed, and they see they cannot rely as they had been taught to do upon the straightforwardness, the justice, and the fair dealing of the English. I cannot sit down without expressing the fervent hope that now that the territory has become English soil, something will be done to advance a country which has such boundless capabilities. I had the pleasure of visiting the Transvaal twenty-seven years ago, in fact I entered the country on the very day the treaty was concluded by which its independence was guaranteed, that independence which has now on very slender pretext been taken from it. At that time the mineral wealth of the country was scarcely even suspected. It was known that there were lead and silver, but beyond that little was known of it. However, I saw enough of it then, and I have heard enough of it since, to feel sure that it is a country the capabilities of which as an agricultural country, and also as a mineral country, it is almost impossible to over-estimate. I trust something will be done, whether by railways or otherwise, perhaps by the aid of the English Government, to advance its interest. Although I am a Natal colonist I shall certainly not plead guilty to entertaining that narrow feeling to which Mr. Moodie adverted of not desiring to see a railway to Delagoa Bay, if that will forward the interests of the Transvaal. I think the interests of the whole Empire are so interwoven that no one part can prosper except to the advantage of the whole.

Mr. BECKER: I gladly endorse everything that has been said by Mr. Donald Currie; I wish also to thank Mr. Moodie on behalf of my friends in the Transvaal. Mr. Donald Currie put the question, how are we to raise the money for the purpose of constructing this railway? As far as I know, during the administration of Mr. Burgers, a rate was levied of 30*s.* on each farm situated in the territory of the Transvaal. I believe there were about 25,000 farms altogether, and that revenue would cover the interest. The late President tried to raise the money and partially succeeded, but owing to the war with Sekukuni, and other causes, the negotiations came to nothing. Mr. Donald Currie remarked that he thought there would be some difficulty on account of the dissatisfaction at present existing amongst the Boers in that country. As far as I know—I have been there many years—a great deal of that dissatisfaction is caused by the authorities having failed to carry out their promises. I know that verbal promises were made to individual Boers about the railway to Delagoa Bay, &c.; those promises are entirely ignored and the Boers feel it considerably, that is one of the principal causes of this dissatisfaction. It is the same story over again. If you recollect, three years ago there was nearly a revolution at the Diamond Fields. What was the cause of it? The people represented the case to the Imperial Government, and very fortunately the Government sent out a British soldier and a gentleman, Colonel Crossman. That gentleman investigated matters and restored order, and the unpopular Governor then administering the Government was superseded by Major Lanyon. The present happy result is a proof of his administration. Why could not that be done with our country? Instead of sending an independent gentleman, disconnected with local politics, they have filled the offices with men from Natal. We gave up our independence, and I with hundreds of others hailed annexation with delight, hoping for a better state of things, but when I left there was a great deal of discontent and disappointment owing to the bad administration.

The BISHOP OF PRETORIA: I really do not rise to occupy ten minutes, but to ask a question, but perhaps before I do ask the question you will allow me to express my gratitude that this Institution opens its doors to outsiders, and to Mr. Moodie for giving an outsider an opportunity of hearing his very excellent lecture. I am sure all those who, like myself, want to understand the question, must be grateful for such a lecture. We have heard from a previous speaker that the representative of the British Government in the Zululand is the great offender in a matter of the vastest importance, in introducing into that country firearms for the use of the natives. I should like to ask if any steps, and if so, what, have been taken or could be taken

to bring such a fact to the notice of the Home Government who might act with some more decision than it appears the Government in the colony has shown, because it strikes me, as one hearing it for the first time, that it is an act of the deepest importance, and the grossest injury to all our South African possessions, and that, therefore, some steps should be taken, and I should be very glad to hear that some steps are about to be taken to put down such a very grievous evil as that seems to me to be.

Mr. CAMPBELL JOHNSTON: To answer the question just now put, I recollect to have seen a little while ago in one of our newspapers an extract from a letter which was written by the Society for the Protection of Natives. It was written to the Colonial Office, bringing before it the fact that our representative in Zululand was the greatest offender in the introduction of arms. I believe it was acknowledged, but with what results I have not heard.

The CHAIRMAN: The introduction of arms by whom?

Mr. CAMPBELL JOHNSTON: By this gentleman; his name is Dunn; there is but one, therefore one does not offend by mentioning his name. He is the right hand man of the Zulu Chief.

Mr. SANDERSON: Might I be allowed to add one word? Mr. John Dunn is the emigration agent of the Natal Government in Zululand, and he is paid a salary of 300*l.* a year for his services in that capacity. The Natal Government simply disclaim any responsibility for his acts outside the particular office for which he is paid 300*l.* a year.

Mr. MOODIE: I have to express my gratitude for the very lenient criticism gentlemen have passed on what I have said. In regard to what has fallen from Mr. Sanderson with respect to the native population of Natal, I notice that in Mr. Trollope's book he puts the number of aboriginal natives at the time of the English occupation even lower than I have, viz., at 3,000. I had not before heard that subsequent estimates had been made as stated by Mr. Sanderson. At the time of my arrival there in 1844, Langalibalele was not in Natal, nor many of the other principal tribes, the main aboriginal body being the fish-eating natives on the coast, and some few outlying ones in other parts, so that though my estimate may be low, I am not at all inclined to put it down as high as Mr. Sanderson at 100,000.

Mr. Currie asked where the capital for the railway is to come from. I think that has been answered by the gentleman who said a word or two on the subject, and I agree with him that if the Transvaal was regarded as a man's own private property, and its resources placed at my disposal, I would soon find the means of carrying out a work so palpably necessary for making it reproductive. I have not, however, considered that a question for an outsider to enter upon here in any special way. As to Sekukuni, when the Transvaal Boers drove Moselikatse out of the country, the territory now claimed by him was unoccupied. The father of Sekukuni had with his tribe been driven out of the country before that time by Moselikatse, and it was only after the Boers came into possession that he returned to it. The present Government are placed in a rather anomalous position from the fact of their having, prior to the annexation and while the Boers were at war with Sekukuni, declared the latter to be an independent chief, and to have the rights of a belligerent power, and now, as in the case of the Zulus, reversing their attitude and enforcing payment of the war indemnity which he undertook to pay to the Boer Government, as a condition of their ceasing hostilities at the peace which was patched up at the last moment.

With regard to John Dunn, nothing has pleased me more than to hear the remarks that have fallen from different gentlemen on that subject. It has been a crying shame for long. I was at Delagoa Bay myself in the early part of last year, and while there Kafirs arrived from Dunn. I saw his own letters, and 1,100 guns were sold in one day to take home to the Zulus, and it is through this means that Cetewayo is holding his present position. It is, however, manifestly unjust to blame the Portuguese at Delagoa Bay for this, or to expect that they shall put a stop to the traffic, while unlimited supplies have been allowed to the natives from our own colonies. I beg in conclusion to return you my thanks for the kind attention you have given me.

The CHAIRMAN: Ladies and gentlemen, it would be wrong for me to detain you long

after the very interesting lecture that has been given by Mr. Moodie and after the very intelligent criticisms that have been made upon it. But having accepted the position of Chairman, I think it but fair that I should show that I know something of the subject. I agree with many of the points that Mr. Moodie has brought before us, but with some of them I cannot entirely coincide. I had the honour of commanding the united troops of South Africa, and therefore it was my province to learn as much of the country as possible. I had also the honour of sending the troops into the Transvaal at its annexation, and therefore a large amount of correspondence concerning that annexation naturally passed through my hands. Now I think it but fair in the first place to observe why we annexed that country, and I wish to state in a few words what were the reasons for our doing so. There had been some dissatisfaction on the part of the Boers and others who carried on the Government at Pretoria, in consequence of the import of arms which was being allowed by the Cape Government and the Natal Government, and which were being sold to the natives of South Africa. That has been one of the great reasons of the troubles that have arisen. During the time I had the command of that country, and which has been for four years and a half, I believe 400,000 stand of arms have been sold to these natives. I cannot entirely agree with Mr. Moodie in condemning the merchants who sold them, because I think it is the province of the parent Government always to give laws and directions to its subjects, and to tell them whether they have a right to sell arms or not. It is a very hard case that our merchants should be accused of want of patriotism in selling arms, while the laws allow them to do so; laws are meant to be obeyed, and if it was considered by the Government that it was deleterious to the interests of England that arms should be sold, it was in my opinion the duty of the Government to prevent that sale, and which they had ample power to do.

As regards the climate of that wonderful country, the Transvaal, I certainly concur in what Mr. Moodie has said, as to its being, perhaps, one of the most extraordinary colonies that England has annexed to itself. It consists of three separate areas. The south-easternmost part is generally called the High Veldt, and that, as Mr. Moodie has told us, averages from 4,000 to 7,000 feet above the level of the sea. That country, therefore, is not a corn-growing country, but it is very rich in minerals, and in the eastern part there is a large amount of gold. I had the pleasure of travelling twice over that eastern section for military reasons, and I saw the greater part of the centre of the Transvaal. The climate is most excellent in consequence of the great height of this portion. Whenever we approach the tropics, the health of the country, and its salubrity for the British constitution, depends very much upon its height. This country is exceedingly salubrious. In it I selected a spot for the cavalry of my division, in order that the horses might remain healthy through the summer. The central portion of the Transvaal is rich for corn-growing and also in minerals. Esterling is a great gold field, from which much ore has been extracted, but the extreme northern part is a low country and deleterious to health. In one portion of it you find the tsetse fly, that destroys horses and makes it so difficult to enter there with troops. It is difficult for Europeans to live in the Low Veldt; it is tropical and is covered with tropical plants. The high range of country lower down, and here (*pointing to the map*) was our happy hunting ground, for my aide-de-camp and myself, while passing over it, killed, in about sixteen days, sixty-nine head of large deer, of which more than twenty were the gnu, of which you may see specimens in the Zoological Gardens; When this country was annexed, I set up a fortified station on the south-eastern borders of the Transvaal, in a position which would be extremely valuable; and as regards Cetewayo and Zululand I give my reasons for building that fort. The town is called Newcastle (and very appropriately so), as immense quantities of coal exist there. The fort in that position, at the neck leading to the Transvaal, would check any movement that the Zulus might make into the colony. We built barracks at Standerton, on account of the high ground, for the health of the cavalry; besides which, it is in an excellent position for communication with Utrecht and also Pretoria, in case of any difficulties arising amongst the Boers, but which I do not anticipate. Hence troops could easily be sent to Middelburg, should Sekukuni think proper to endeavour to do any mischief in the

Transvaal itself. I will not, however, occupy your further time in stating the military reasons for the works which I undertook. I think it is best to stick to the point which has been presented to us in the paper, with reference to the future of the Transvaal, and as so much has been said on the question of railways, it only would be right to say a word or two upon that subject. The question has been raised whether the railway should start from Delagoa Bay, or whether it should pass through Natal, or whether it should go from East London, through Queenstown and the Orange Free States, and so towards the north, or whether it should go from the Cape itself by Beaufort West. In a railway, a great deal depends on the port from which the railway starts, and unfortunately in South Africa we have no good harbours; Sir John Coode's estimate for making a harbour at Port Elizabeth was 900,000*l*., and that is no small sum. At East London he estimates the cost of making such a harbour as is now required at 400,000*l*., and at Durban, in Natal, at 400,000*l*. The ports are distant from the Transvaal: I do not say that the money should not be spent upon them, but the question Mr. Moodie has brought before us is especially the Transvaal, and, therefore, I think that is what we should regard especially this afternoon. Delagoa Bay is undoubtedly the best harbour in South Africa, and it is the nearest to the Transvaal. I agree in one thing, that the difficulties in starting a railway from that port would be very great so long as it belongs to the Portuguese, therefore, I sincerely trust some arrangement will be made with Portugal by the British Government that will enable it to become British property. It is not that I should not wish to see a railway through the Cape Colony or Natal, but I should like to see a railway from Delagoa Bay into the Transvaal. The difficulties, as far as the climate is concerned, are not so great, especially looking at the energy that has been shown in the construction of a railway through the Isthmus of Panama, where, some say, that one hundred men per mile died in making it. I believe there would be no such difficulty in the construction of the Delagoa line, for it is only to a certain distance from the coast that the low unhealthy country exists. The high part of the country lies 4,500 feet above the lower or coast level; when once this is surmounted, it is almost a level plain until you arrive at Pretoria, the same thence to Potchefstroom. As regards the annexation of this country, we annexed it in order to prevent the native tribes from attacking it; we felt as long as the country was inhabited by white people, the paramount State, England, the most powerful amongst the white colonies of that country, must protect it, and, therefore, if the Boers, in their folly, or their conceit, determined to annex, as Mr. Moodie said, a considerable amount of Cetewayo's country, whether they had a right to treat with Cetewayo to do it or not, still if Cetewayo determined to attack the Boers, we felt that he would easily have overrun the Transvaal; and, had we not taken action when we did, he would have burnt Pretoria, and Heidelberg, and every station on the eastern side of this country. We, therefore, took the initiative, and sent a small force there (the name of England goes a long way in that country); he was thus prevented from carrying out his intentions. I think it was the wisest measure that could have been adopted for Lord Carnarvon to choose for that particular duty his Excellency Sir Theophilus Shepstone, who is an exceedingly clever man, has a perfect knowledge of the Dutch language, and also of the Zulu language, and is intimately acquainted with Cetewayo, the King of the Zulus. His appointment was one which commanded general confidence. In my opinion he performed his very arduous duties in a judicious manner; his position was certainly difficult, he was said by some to have turned against his son, Cetewayo, and why? Because, when he was Secretary for Native Affairs in Natal, he had to guard the interests of Natal, and so keep the Zulus as quiet as he could; and he was supposed rather to take the part of the Zulus than of the Boers; but as soon as we had annexed that country, his business was to endeavour to be even-handed, and, therefore, it looked as if he was playing false with Cetewayo. An observation has been this afternoon made, why did we not put down Cetewayo? Gentlemen, I can assure you war is a very serious thing; from the mouths of the head men of Cetewayo, I ascertained that Cetewayo has at least 20,000 men in arms, 15,000 of whom have muskets, and at least 2,000 of those are breech-loaders. He has no cannon, though he has tried to get them. In my experience in South Africa, I

found the 2 cwt. small guns of the greatest utility, and it behoves us to take care to prevent the natives getting cannon. An observation has been made with regard to Mr. Dunn, and it has been said, why do not we prevent Mr. Dunn from assisting Cetewayo? I beg leave to observe that Cetewayo's country is as independent of Great Britain as Madagascar, or as any other part of South Africa. We have no claim over that country, we make treaties with them, but we cannot say to Cetewayo "You shall not buy arms;" we can only, by our influence, try to prevent it. John Dunn has as good a right to buy muskets at Delagoa Bay, as England has to buy them of Belgium, or anywhere else. Cetewayo has now got a large army, and he has a clever commissariat entirely administered by the women of the tribes. These women carry many days' food for their husbands on their backs; they think nothing of running twenty miles of a night to carry them their food, and, therefore, Cetewayo could easily make a raid into our country of, say 150 or 200 miles, and his troops would be supplied by a commissariat nearly as perfectly for their requirements as our troops are, by the transport carriers. We should, therefore, be very cautious in saying that Cetewayo could not do this or that, or that we could put him down. I believe Sir Edward Bulwer has adopted the wisest course in causing the arbitration which is going on at this moment, and which I have every reason to believe and hope will end in the most satisfactory way, and that an arrangement will be come to by which we shall avoid a war in that country. If we could stave off wars in South Africa for some time, it is my belief that by giving the inhabitants employment in the construction of railways and other works, we shall civilize the people, and it is better to civilize them by civil means than by military operations.

Mr. Moodie referred to some one who rather condemns the policy of Great Britain as to its colonies, and holds up to our notice the Spaniards and Portuguese as being much more successful than we have been. I cannot help thinking that the Spaniards and Portuguese may have improved their vast colonies; but still when we look to the history of Pizarro, Cortes, and others, we shall generally find that their operations have rather been towards improving the people off the face of the earth than civilizing them in the fashion which Great Britain uses her best to effect. We now have in South Africa a Governor who is a man of justice, of equity, of talent, and determination, the attributes that an Englishman should possess, and that is his Excellency Sir Bartle Frere. If any man can raise the British name in that country beyond the great position which it now holds, I believe that man is Sir Bartle Frere. He is now using his best endeavours to quiet Africa, and although the commencement of such a work may be a military one, I have every belief that he will be successful. He is animated with the ideas of justice and honourable feelings towards the natives, as well as towards ourselves. With reference to the Boer inhabitants, I consider them to be an honest, good-feeling, excellent people; they are exceedingly religious, as Mr. Anthony Trollope has stated, and as has been brought before us by Mr. Froude and those who have lately visited that country. The Boer is not to say an ignorant man, but he has an entire want of knowledge of the rest of the world; he has buried himself in the wilds, and consequently does not understand our advancement in civilization. The late Prime Minister, Mr. Gladstone, once said that there is no reason to suppose that we are wiser than our ancestors because we are more scientific. I am not at all sure that the Boers are not as clever, in their own generation, as any of us, but they take a long time to develop their ideas and to think about things. In order to show you the total ignorance of these men, when I sent the army up into that country, the Boers came round my Officers, and said, "We know what you are going to do. We know why you are "coming here; you intend to lay hold of all our handsome young men, and take "them off to the Grenadier Guards, and you intend to tax us, and worry us in every "kind of way, and make us pay all the expenses, not only of this annexation, but "also to tax us to pay for your war with Russia, without giving us any share in the "government of our country." We explained to them that what we were doing was entirely for the object of saving them from the natives. When they saw that we paid for everything in gold (for they would not touch a bank-note), and that a great deal of gold passed into their hands, their feelings were changed, and turned very much in our favour. I have every confidence that Sir Theophilus Shepstone will be

able to give matters a right direction. One of my Officers, whom I placed in command of the cavalry, received while I was down at Williamstown, letters from the Boers of the Transvaal, offering their services as cavalry, and to bring their own horses. We had also offers of service from volunteers in all directions; this is exceedingly satisfactory and encouraging. One of the great difficulties of emigration into the Transvaal is that it is very expensive to go there. It costs a great deal of money to go to Cape Town, as much again to go to Durban, and more still to go from Durban into the Transvaal. It also takes a long time. It is impossible for a man to go from England to the Transvaal under three months. As soon as he gets there, if he is steady, he will be well rewarded. When I was there, bricklayers' wages were 25*s.* a day and carpenters' wages 25*s.* a day. A sovereign was charged for shoeing a horse; in fact, all labour is rewarded in the same proportion. The greatest difficulty I had in building barracks in Pretoria was the want of labour; therefore, I think, as the field is open, all that is to be done is for the reapers to go and reap the harvest This country is a wonderfully productive country. The great difficulty which Mr. Moodie has so prominently brought before us is that the Government has no land to sell to the emigrants who may go there. The system of the Government of the Transvaal has been that when a young boy reached the age of sixteen, he had a right to ask his Government for a grant of 6,000 acres of land. That has been one of the reasons for the quarrel with the natives, because the Government allotted this land, and thus encroached upon the native possessions. I have known instances in which 6,000 acres of fine land, which, if it had labour, could grow corn, has been sold for two bottles of whiskey. I knew of 6,000 acres close to Middelburg sold, some three or four years ago, for a few bottles of whiskey and two or three pair of stockings, and for which, since the annexation of the Transvaal by the British Government a gentleman refused £1,100. Some gentlemen are very large proprietors, one at Potchefstroom possesses no less than 800,000 acres of land, the greater portion of it being corn-bearing. He naturally wishes to get emigrants into the country, and he invites them upon the most reasonable terms. I see no reason why companies should not be successful in arranging with these large landowners to get land. As a total outsider, I would advocate that large taxation should be put upon these large landholders, and thereby oblige many of them to sell to the State and others their lands. This would give the State a means of encouraging the emigrants who came out by allowing them to obtain land at something like fair prices. I believe this alone would help forward the Transvaal to future and great prosperity. The Transvaal possesses a few diamonds, a great deal of gold, and lead in very large quantities. The lead produced, now goes entirely to the centre of Africa, in order to utilize some of those 400,000 stand of arms that have been taken there; and so great is the profit in lead mines, that a gentleman near Potchefstroom who purchased, about two years since, an estate containing this mineral for the sum of 50*l.* or 60*l.* sterling, is now realizing from this property about 2,000*l.* a year. The cobalt mine near Middelberg was purchased from one of the Dutch farmers. It was bought for about 1,000*l.*; it is now said to be paying many thousands a year. Coal is most abundant.

The native question, however, is the great difficulty of South Africa. As to sweeping the natives away by force of arms, or by the brandy bottle, I believe the thing, even if it were just or right, is impossible. The nature of the habits and customs of the people encourages an increase in the population, and as we accept the principle of putting down all fighting amongst the native tribes, so it is a natural consequence that they should increase enormously; they have broad fertile lands, with numberless herds of cattle. Thus they have plenty of food; no starvation exists under the mild and honourable laws exercised by Great Britain; we must therefore anticipate a continual increase of population, and we must therefore be prepared to meet this difficulty. Our great panacea for this is to teach them as far as possible (for they are a very lazy race), the advantages of our modern institutions, that are now cropping up all over the land. To this end we should encourage railroads through the country, from Delagoa Bay as well as from other ports. I should be only too glad to see a check placed upon the sale of arms; they look at arms in the first instance as a great prize, as a boy does a watch. It must not be

supposed that the natives cannot use firearms. To my certain knowledge many of them can shoot just as well as we can, and they only require a small amount of practice to make them good marksmen. There is nothing so dangerous as to place a firearm in the hands of a native, with their ignorance and fanaticism. It is as dangerous to place a musket in the hands of a native as it would be to put a firebrand in the hands of a child, and leave him in his bedroom.

As to the future government of this country, it would be injudicious for me to say more than a word. As long as Great Britain has anything to do with the annexation of a country it is always guided by the most honourable principles. It has been assured to that country by Sir Theophilus Shepstone that they will have their parliamentary Government, but he has not said when. Things must develop themselves, war must cease, and other circumstances happen before such an enlightened institution can be put into their hands; and before we feel sure that they are able to use it for their own benefit, as well as for the benefit of South Africa. Everywhere it is the endeavour of Her Majesty's Government to send officers to those countries whom they can trust, and in their selection of Sir Bartle Frere, they could not possibly have made a better. In Sir Theophilus Shepstone they have one whose perfect knowledge of the country and whose judgment will bring them through the difficulties, if any one can. As to the Transvaal itself, I consider that by a judicious Government, and by the support of Great Britain, it will become in time one of the most valuable of our colonies; it has all the conditions of greatness, and owing to its climate, its natural position, and its fertility, I believe it has a future not to be exceeded by that of any one of Her Majesty's colonies.

I am sure you will all agree with me in passing a vote of thanks to Mr. Moodie for his very excellent paper.

LECTURE.

Friday, May 24th, 1878.

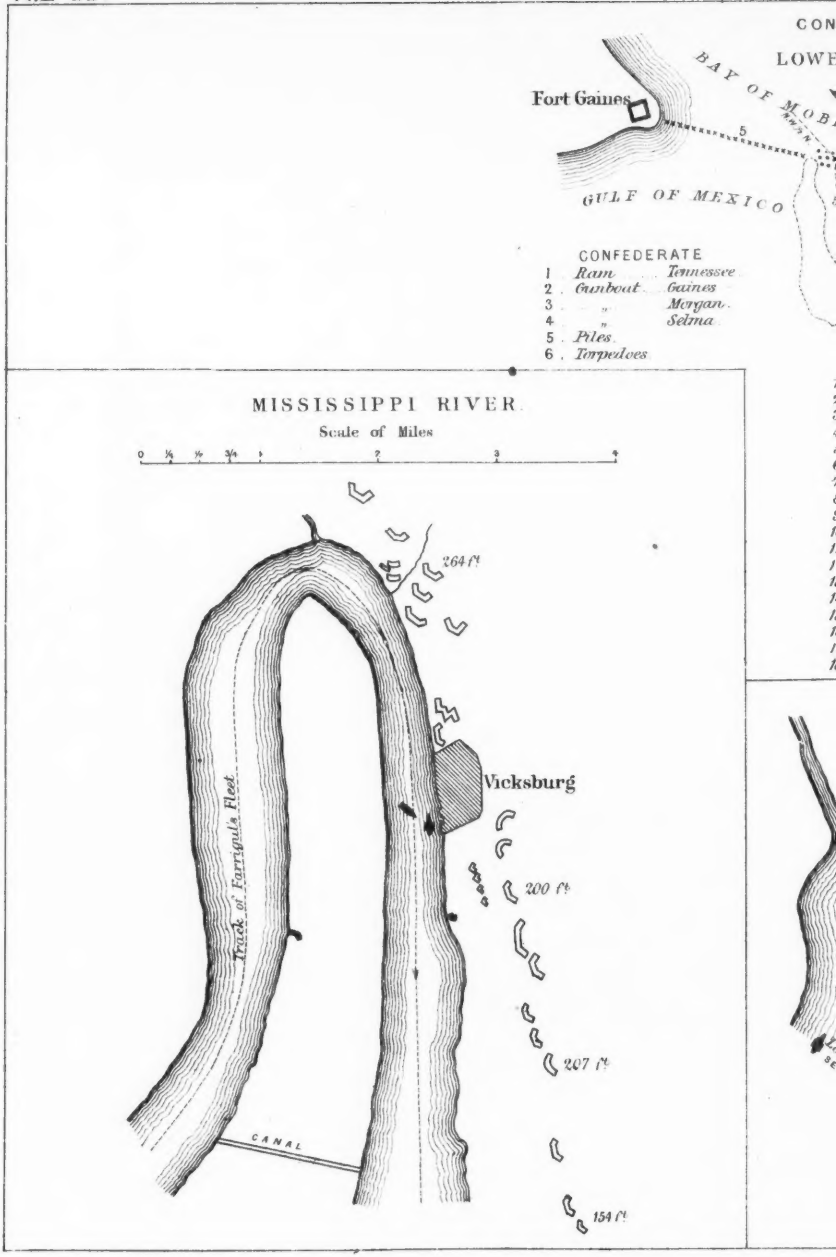
ADMIRAL HUGH DUNLOP, C.B., in the Chair.

FACTS CONNECTED WITH THE NAVAL OPERATIONS DURING THE CIVIL WAR IN THE UNITED STATES.

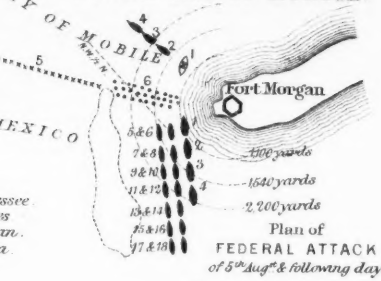
By Rear-Admiral R. V. HAMILTON, C.B.

AT the present time, when our country may soon be involved in a war in which the Navy will have an important part to perform, and with ships and weapons as yet almost untried in actual warfare, I trust that the following facts that I shall place before you, connected with the very important work performed by the American Navy during their Civil War, may not be uninteresting, and that some information may also be derived from them, as, owing to the exigencies and peculiar nature of that war, a very great portion of the naval work was done by ships and guns invented or adapted to meet novel modes of warfare. And I have no hesitation in saying, it was their naval superiority which enabled the Northerners to penetrate through the various rivers, creeks, and bayous into the heart of the Southern Confederacy, whereby the Armies were able to advance, when, owing to physical obstacles, they must have been arrested in their onward march. The Navy also, in several instances, decided the fate of battles by the protection afforded by its fire to the wing of the Northern Army resting on a river, as at Pittsburg-landing and at Vicksburg; and the escape of Morgan's expedition in Indiana and Ohio, across the river into Kentucky, was prevented by a gunboat, which arrived at different fords in time to stop his men crossing. On the Navy, in a great measure, also depended the supplies and transport of the Army, but, as these services were not as showy and interesting as the numerous battles between the conflicting armies, they were but little known or appreciated by the general public; a complaint, I need scarcely say, not peculiar to the American Navy.

Those who have read the history of the Paraguayan War will also know that, but for their Navy, it is very doubtful whether the Brazilians would have conquered the Paraguayans, at all events not for many


CON
LOWE
BAY OF MOBI
Fort Gaines
5
GULF OF MEXICO
CONFEDERATE
1 . Ram . . . Tennessee
2 . Gunboat . . Gaines
3 . " . . Morgan
4 . " . . Selma
5 . Piles
6 . Torpedoes
MISSISSIPPI RIVER
Scale of Miles
0 ⅛ ¼ ¾ 1 2 3 4
264 ft
Vicksburg
Track of Farragut's Fleet
200 ft
207 ft
CANAL
154 ft

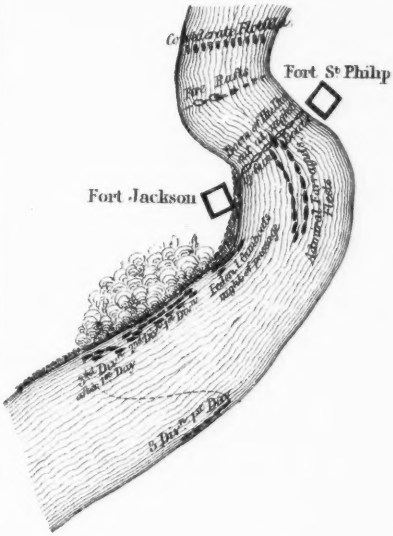
CONFEDERATE DEFENCES of the LOWER BAY OF MOBILE.



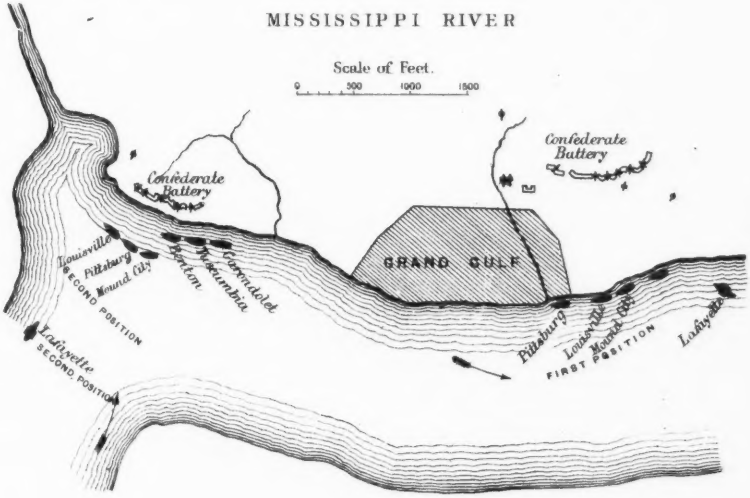
FEDERAL

1	Monitor	Tecumseh.
2	"	Manhattan.
3	"	Winnebago.
4	"	Chickasaw.
5	Steamer	Octarara.
6	"	Brooklyn.
7	"	Metacomet.
8	Flagship	Hartford.
9	Steamer	Port Royal.
10	"	Richmond.
11	"	Seminole.
12	"	Lackawana.
13	"	Kennebec.
14	"	Monongahela.
15	"	Itasca.
16	"	Ossipe.
17	"	Galena.
18	"	Oneida.

NEW ORLEANS FORTS.



MISSISSIPPI RIVER



J. Jobbins

more years than the war lasted. I, therefore, infer that in a war between two countries, if either or both are intersected by rivers, the victory will rest with the one possessing the most powerful Navy, supposing they are in other respects tolerably equally matched, as was the case in these wars, where, owing to the long distance from their bases of operations and other obstacles, the numerical superiority of Federals and Brazilians would have been neutralized but for their Navy.

Although I was on the North American Station during the greater portion of the Civil War, I must confess to great ignorance in nearly all relating to the naval operations; and presuming many of my hearers and future readers are not much better informed than I was, will, I trust, be my apology for bringing before them the information I have but lately acquired, and also the hope that valuable information may be obtained, in discussion, from those who have read up the subject more completely than I have done.

It is unnecessary to enter into the reasons for secession, observing, however, that by April, 1861, all the slave States had seceded except Maryland, which, being a border State, would have felt the whole brunt of the war at first, but their feelings were, beyond question, undoubtedly with the South, although, fortunately for herself, Maryland was kept down by force of arms. The Civil War commenced on April 12th, 1861, when the Southerners fired the first shot at Fort Sumpter, in Charleston Harbour, which speedily surrendered, when the Confederacy possessed all the forts, except Fort Pickens, near Pensacola, and the whole sea-board from the mouth of the Chesapeake round by Florida to the Rio Grande, the boundary between Mexico and Texas. They also commanded that important artery, the Mississippi, from its mouth to its junction with the Ohio, the northern boundary of the eastern slave States.

The warlike stores in the country were probably about evenly divided between the belligerents, as the Confederates had seized all the Southern forts and navy yards.

The guns consisted of 10 and 8-inch Columbiads, 42, 32, and 24-pounders and under; no rifled pieces had been introduced into the Army or Navy. The North, however, retained the fleet, then consisting of 42 vessels, steam and sail, carrying 550 guns, manned by 7,600 seamen and marines. It was at once seen that this force was totally inadequate to maintain a blockade of over 3,000 miles of coast, to provide for the wants of the Army, and to obtain command of the inland waters. By December, 1861, the number was increased to 264 vessels; December, 1862, to 427; December, 1863, to 588; December, 1864, to 671; manned by 51,500 men; most of these vessels were, of course, not fit to encounter hostile fleets at sea, but they were adapted to the peculiar work required of them, which is saying quite enough.

Nearly all the Monitors were built by contract, the original "Monitor," built by Ericson, was completed in four months, and, as is well known, arrived in Hampton Roads, March 8th, 1862, just in time to prevent the "Merrimac" completing her work of destruction on the wooden fleet laying off Hampton Roads.

Ericson, it appears, offered his invention to the Emperor Napoleon in September, 1854; it is fortunate for us it was not offered to, and accepted by, the Russians, or our fleets in the Baltic and Black Sea might have come to the same untimely end as the "Congress" and "Cumberland" frigates, from the guns and ram of the "Merrimac." Many other Monitors were built after the success of the original; also numerous wooden vessels, for the various work required in harassing the enemy in the network of rivers and creeks intersecting the Southern Confederacy, experience proving screw vessels were not well adapted for the crooked and narrow rivers, from inability to go straight astern, and being, consequently, obliged to expose their whole broadsides in turning, if necessary to retreat. A dozen side-wheel steamers were built, but as these did not meet all the requirements, 34, both ends alike and adapted, like our Upper Thames steamers, for going either way were built, drawing only 8 feet water and heavily armed. On the Upper Mississippi, a fleet of ironclads was built by private contract. Mr. Eads, of St. Louis, undertook to launch 7 with engines and boilers on board in 65 days from signing the contract, ready to receive their crews and armaments; the first one was launched on the 12th of October, 1861, 45 days after the keel was laid; the next, 10 days afterwards, the remainder within the assigned time. These vessels only drew 6 feet and carried 13 heavy guns, 11 and 9-inch, 3 of them firing right ahead and 2 astern. When we consider this was done on the Upper Mississippi, where an armed vessel had never been seen prior to the war, that when the contract was signed, "the timber to construct them had to be cut, the engines "to be built, and that the rollers and machinery to roll the iron plates "to be constructed," we may marvel at a private individual undertaking the responsibility; did it not show what can be effected by a free people fighting for what they consider a just cause?

In April, 1862, Mr. Eads prepared plans for 8 light draft ironclads, to draw $5\frac{1}{2}$ feet, also others of $4\frac{1}{2}$ feet, with a turret of 8 inches of iron, and even of the very light draft of $3\frac{1}{2}$ feet, with a turret of 6 inches, and most of the vessels he constructed drew less water and had more speed than was contracted for. In less than a year Mr. Eads built 14 armoured vessels, 4 mortar boats, and converted 7 transports into "tinclads," as musket-proof craft were called—all vessels that may be considered perfect successes for the work they were built to perform. The American Government knew what they wanted, threw overboard all old ideas when found unsuccessful, and availed themselves of the undoubted inventive genius of the country and its resources, put their best men forward, and succeeded, and although their innovations were, in many respects, apparently startling, they were, in reality, well considered beforehand.

Great as is the credit due to the Northerners, the Southerners were fully their equals in inventive genius and readiness of resources, as is shown by the 13 or 14 ironclad rams they constructed, or which were destroyed before completion; the "Manasses" for instance, which, in October, 1861, six months only after the declaration of war, drove the Mississippi blockading squadron out of that river, and the "Merrimac,"

in March, 1862, of whose exploits it is unnecessary to say more. And so badly off were they for iron that the iron bolts of some of their ironclads were made from lightning conductors; and the heaviest gun they possessed at the commencement of the war was a 10-inch smooth-bore, but before it was over they had 10-inch rifled guns, and even 600-pounders. Before the war, the South depended on the North for, I may say, every manufactured article; but, as Von Scheliha observes, from necessity, "foundries, powder-mills, and "other establishments for the manufacture of warlike implements "sprang up as if by magic," but the South failed in having no skilled mechanics, and, as a rule, they had to engine their vessels with make-shifts from land engines, nor, when completed, had they a seafaring population to man them, which accounts for their naval disasters.

I think we may all here, men of war as most of us are, lament the perversion of so much energy and talent to the arts of war; the arts of peace never received so much attention or made such progress in the same space of time. The moral, however, I am about to draw from this is, that with the number of eminent firms we have in this country, skilled in iron and ironclad shipbuilding, our Government have only to make up their minds what course they intend adopting in regard to attacking forts, &c., of any nation we may be at war with, and be prepared to rapidly run up, as the Northerners did, light draught ironclads, adapted for the special work.

I am sure Mr. Scott Russell, from whose clear practical speeches in this Institution, many of us have gained useful information, will guarantee, in six months, any amount of light draught vessels our naval leaders may require for any special work; as to torpedo boats we know that we can obtain ten for one of any other nation. The great resources of our dockyards will probably be fully taxed to maintain the cruizing fleet in a state of efficiency. Our private firms can supplement those resources to any extent that may be required.

It will be no use attacking with inadequate forces and scant supply of ammunition, as we did at Sweaborg in 1855. It will not be worth while attacking any place it is not intended to capture, and in these days naval attacks will closely resemble a military siege, that is, will occupy time and great consumption of ammunition, nor must one or two repulses dishearten us, we must succeed in the end.

The groundwork of the facts I am now going to bring before you, relative to the conflicts of ships *versus* forts, is mostly taken from a "History of the Navy during the Rebellion," written by the Rev. C. B. Boynton, a Professor in the Naval Academy and Chaplain to the House of Representatives, from official documents. The historian's original remarks are, in my opinion, a great contrast to the modest, unassuming, matter-of-fact despatches of Farragut, Porter, Du Pont, Foote, men of world-wide reputation, and others too numerous to mention, but his work I advise all here to read for the novel and practical information it contains. I think it ought to be supplied to every Commander-in-Chief, and to every ship if procurable, and even our officials might gain valuable information, on the means adopted to keep health, comfort, and content amongst the crews employed on

the various arduous duties on an enemy's coast for long periods. I have also consulted Von Scheliha's "Coast Defence," Report of Secretary of the Navy on Armoured Vessels, and a paper on the "American Navy," in this Institution, of June 1st, 1868.[1]

The conflicts of ships against forts may be divided into two classes. First, those of wooden ships armed with old-fashioned smooth-bore guns, of 11, 9, and 8 inches calibre, supplemented eventually by rifled 150-pounder guns, against forts built of brick or stone before the war (which practically were found useless against the fire of the ships), and earthworks armed similarly to the ships. Secondly, those in which the new ironclad ships attacked earthworks and other forts constructed on new principles by the Confederate engineers when they found how easily their earlier batteries were taken.

The first important naval expedition was against the forts at Hatteras Inlet, which commanded the main entrance into Pamlico Sound. This and Albemarle Sound were the basins into which the numerous rivers of North Carolina emptied themselves; and by this network of sounds, rivers, creeks, bayous, connected with several lines of railway, the Confederates were enabled to transmit the warlike supplies brought by the numerous blockade runners from Nassau, Bermuda, and other ports; also to send away the cotton with which they paid for those supplies. That they realized the advantage they possessed, is shown by the earthworks they constructed at Roanoke and Ocracoke Islands, and at other points in the river too numerous to mention in this paper. At Hatteras Inlet, Fort Hatteras mounted 20 guns, and Fort Clarke 5 guns, size not mentioned, but probably 10-inch and 32-pounders, as similar guns were found spiked at Ocracoke Island, abandoned without fighting.

The fleet under Commodore Stringham consisted of two 45-gun steam frigates, "Susquehanna" paddle, 17 guns, three other steamers, and "Cumberland," sailing corvette of 24 guns, altogether 158 guns; 900 land forces were attached, but 300 only were landed, and they were unable to render any assistance.

This attack had to be made from seaward, and owing to shoal water, at distances from one and a half to two miles from the forts. It commenced at 8.45 A.M., August 28th, 1861; the "Wabash," 45 guns, towing the "Cumberland" in towards Fort Clarke, which was half a mile nearer than Fort Hatteras, followed by the flag-ship and other vessels. "These vessels passed and repassed Fort Clarke, pouring in "a continuous storm of shot and shell, the firing of the garrison being "wild and irregular, their shot falling over and around the ships." No mention is made of their being struck or of any casualties. The ships did not follow in one another's wake, and varied the distance from the forts on each passage, rendering it almost impossible for the batteries to get the correct range. At 12.30 P.M. Fort Clarke was abandoned. The "Monticello" was sent in to take possession, but owing to shoal

[1] "The American Navy; its organization, ships, armament, and recent experi-"ences." By J. Randolph Hamilton, late C. S. Navy. See Journal of the Institution, vol. xii, p. 243, *et seq.*

water, grounded, and had to come out, the Commander observing—"We were about fifteen minutes in this *tight place*, during which time "we fired thirty shells." They were struck by five shots and one shell, sustaining no particular damage.

At 6.15 P.M. the engagement ceased for the night, recommencing at eight next morning, and by eleven, Fort Hatteras surrendered. "The "fire this day was very accurate, the range being two miles." The garrison could not stand to their guns, and took shelter in the bomb-proof; at length a shell struck a ventilator on the bomb-proof and went through; it did not explode, but created a panic, and as another exploded on it, it was evident that the magazine was not safe, and the white flag was run up, and the fort surrendered to the Navy, the Governor refusing to do so to the troops, who had taken no part in the fight. "This "was the first important experiment of the war in engaging earth-"works with ships, and the result was awaited with no small anxiety "by those who had planned the expedition."

Commodore Stringham and his followers were highly complimented by the Navy Department for the skill displayed, but as there was not a heavy butcher's bill, the feat was thought little of by the country at large.

This was a fair fight between wooden ships, having about seventy guns on a broadside, engaging the twenty-five of the earthwork batteries, probably of a similar nature, as the Confederates had obtained very large supplies of naval guns when they took possession of Norfolk Navy Yard; and as the distance was one and a half miles, it was against the ship. The successful result, in my opinion, is owing to the superiority of shell-fire. Had solid shot been used, the earthworks would scarcely have suffered.

The next engagement of importance was the capture of Port Royal, a splendid harbour in South Carolina between Savannah and Charleston. The combined expedition was commanded by Admiral Du Pont and General Sherman; including transports, 50 steamers sailed from Hampton Roads October 29th, 1861, 25 colliers having been dispatched the day before. A very heavy gale scattered the fleet, but at 8 A.M., November 4th, most of the ships had arrived off Port Royal bar—a formidable one at all times, but still more so then, as the buoys and channel marks had all been destroyed. By the skill of the surveyors, however, the passage was soon rendered practicable, and the whole fleet safely anchored in Port Royal roadstead by the evening of the 5th, and the forts had been reconnoitred. These were Fort Walker on the south shore at Hilton Head, mounting 23 guns, two of which were 6-inch rifle and one a 10-inch shell gun; Fort Beauregard, on the north shore, mounted 20 guns, some 6-inch rifles, one 10-inch, one 8-inch Columbiad; the remainder of the guns were most likely 32 and 24-pounders. The rifled guns were probably manufactured in the South, since the war commenced in April. These forts were two and a half miles apart, consequently could not be engaged at the same time, except at long range.

The main squadron consisted of "Wabash," 45 guns, "Susquehanna," 17, three sloops, three gunboats, and a sailing sloop, mounting in all

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The main squadron consisted of "Wabash," 45 guns, "Susquehanna," 17, three sloops, three gunboats, and a sailing sloop, mounting in all

about 100 guns; the flanking squadron consisted of six gunboats, mounting about 18 guns.

Every preparation having been made, the fleet weighed anchor at 8 A.M., November 7, and formed line ahead in close order, the "Wabash," flag-ship, leading; the forts opened fire about 9.25; the fleet replied, passing into the harbour midway between the two forts, engaging both at long range. When two and a half miles above the forts, the fleet turned to the southward. At 10.15, signal for close action was made, and the "Wabash" passed Fort Walker at a distance of 800 yards, when abreast of it, the other vessels following, pouring in a destructive fire; at the second round, the ships passed within 550 yards, thus throwing out the aim of the land gunners, while some of the gunboats took up an enfilading position, adding to the confusion of the garrison. Having come down from the north and delivered its fire, each ship went round and approached the fort on a different line; on the third round of the ships, the fort was abandoned, the garrison seeking shelter in the woods. At 2.20 P.M. the Union flag was hoisted in Fort Walker, and at sunset it was discovered that Fort Beauregard had also been deserted. The forts thus taken by this wooden fleet alone were earthworks, built since the commencement of the war, and probably by good engineers; and yet Fort Walker, mounting 23 guns, supported by Fort Beauregard, succumbed to the fire of a fleet mounting between 50 and 60 guns on each broadside engaged, six rounds from each in reality doing the business. The ships sustained no damage as far as I gather from the history; but Colonel Fletcher mentions they had thirty-two killed and wounded. So great was the panic occasioned by these successes of wooden ships against forts, that extensive works constructed to protect Fernandino, an important port in Florida, were abandoned. Admiral Du Pont reports they were as complete as art could make them. There were eight or nine forts altogether thus abandoned to protect a very crooked and shoal river. Many other forts built to protect important rivers or towns in the vast network on the Atlantic coast were also abandoned. There were also numerous engagements between extemporised gunboats converted from ordinary wooden traffic steamers, totally unprotected, and heavy batteries in these inland waters, in which, as a rule, the gunboats won the day; to mention them all, however, would be beyond the limits of a paper, so I will now proceed to narrate the exploits of the Gulf of Mexico squadron under Farragut, in attacking the forts on the Mississippi till he formed a junction with the Upper Mississippi squadron above Vicksburg, to the exploits of which I will then turn your attention.

On the 20th January, 1862, Admiral Farragut was appointed to command the Western Gulf of Mexico blockading squadron, with directions to take New Orleans. The naval force consisted of the "Colorado" and "Wabash," 40-gun frigates; these it was found drew too much water to cross the bar; three large corvettes, the "Hartford," "Brooklyn," and "Richmond," of 21 guns each; "Mississippi" and "Pensacola," paddles, and thirteen smaller vessels, the whole mounting about 150 guns. In addition, twenty-one mortar schooners

were attached, with several steamers to tow them, under Commander David Porter, who in less than nine months was Acting Rear-Admiral commanding on the Upper Mississippi.

Farragut arrived off the river on the 20th February, and the work of getting the ships over the shoal bar commenced, which occupied nearly two months, as several of the larger ships had to be cleared of everything and fairly dragged through the mud. Great importance had been attached by the Navy Department to getting the frigates over the bar, as "the tops of these large steamers are from 30 to 50 feet "above the forts, and command the parapets and interior completely "with howitzers and musketry." The draft of water of these ships was given, to show how carefully considered the expedition was; even the number of tons to be removed to lighten an inch is given in the orders.

The Confederates had made great preparations to resist the attack. Fort Jackson, on the west side of the river, mounted 75 heavy guns, including rifles and 10-inch Columbiads. Fort Philip, on the other side of the river, which is here about half a mile wide, mounted 25 guns; the flotilla consisted of thirteen armed steamers,[1] the steam battery "Louisiana," 16 guns, either not engined or it was disabled, and the ram "Manasses." A very strong barrier was also thrown across the river within point-blank range of the forts, and the defences, certainly judging from precedent, appeared to justify the confidence of the defenders in their repulsing the assailants.

The mortar vessels bombarded the forts from the 18th April to the 23rd, when it was decided to make the attack that night (an opening had been previously made in the barrier). At 2 A.M. the signal was made to weigh, but owing to the strong current and the difficulty always experienced in getting a large number of vessels under weigh simultaneously, it was not till 3.30 a general move ahead was made, when all went forward as rapidly as they could; the Confederates not being idle, the forts opened fire, the shores were lit up by fires (which I am inclined to think were on the whole as advantageous to the fleet as to the batteries), fire-rafts were sent down, one of which set fire to the flag-ship. The leading vessels replied to the forts, into which a shower of bombs was sent by the mortar schooners; the smaller steamers poured shell, grape, and canister into the water batteries, driving the men from their guns.

The result was, the forts were passed, the loss to the fleet being the "Varuna," a converted merchant vessel of 800 tons, sunk by a ram, 47 men killed, 137 wounded; total 184; and the fleet was struck 165 times, as the "Brooklyn" was hit by 16 shot and only one shell I believe the Confederates were not well supplied with shell. "Pinola" was also hit by 12 shot. The Confederates had 52 killed and wounded, according to Pollard.

"Thus," to use the words of the historian, "was fought and won "the greatest naval battle of the war, which was probably the boldest "and most successful effort ever made to match wooden ships against

[1] According to Pollard only eight were armed, and "Louisiana's" engines were useless.

" forts at close range, armed with heavy guns, both rifled and smooth-
" bore, and when, in addition, the forts were assisted by ironclad rams
" and a fleet almost as numerous as our own," although "doubtless in-
" ferior in strength and endurance to it." And when we consider the great authorities who at that time were strongly of opinion that an attack by wooden ships against forts was hopeless, I am sure you will all agree with me that Farragut ranks in the first class as a naval commander. The river was there only half a mile wide; the current runs three or four knots, and with the usual eddies at a sharp bend, as was the case here. The Mississippi also is liable to sudden fogs coming on; in my own ship ascending it, such happened, when the pilot instantly dropped anchor, so that the passage of a fleet by night, unresisted, would have been no light undertaking.

The result of this battle was the surrender of the forts, the capture of New Orleans, and the command of the Lower Mississippi, which cut off the south-eastern portion of the Confederacy from the unlimited fresh supplies from Texas. It was by far the greatest blow the Confederacy sustained in the first year of the war, and at the trifling cost of less than 200 killed and wounded, one hired steamer sunk, and the total damage sustained by the rest of the fleet not being equal to the sinking of another steamer. The "Mississippi," a formidable ironclad, which the Confederates had been unable to complete, was burnt; this vessel was intended for a sea-going ship, with which it was hoped the hostile fleet would be destroyed, and the Atlantic coast cities laid under contribution. Another ram was also sunk off the Custom-house; and an immense quantity of cotton and other stores were burnt.

Up to this period, a little more than a year after the war commenced, we find the forts at Hatteras and Port Royal (earthworks quite recently constructed), and those of masonry in the Mississippi, below New Orleans, with that city itself, taken by the Navy with wooden vessels alone; all these, however, were water batteries, with which ships are on more equal terms than when the forts are placed considerably above them. Moreover, they had no troops in the rear to prevent the forts being occupied by the Navy when silenced by its fire, and the garrison driven out; nor could troops approach, except by sea. Higher up the river, forts were placed on more elevated ground; and, when silenced by the superior fire of the fleet, the men withdrew, firing again as soon as the fleet passed them: for although silenced, they were not disabled, and they had troops in the rear too numerous for the Navy to be able to take possession.

The country and Navy Department, misled by the capture of Forts Jackson and Philip, under very different circumstances, ordered Farragut to attack Vicksburg. "This town is in a sharp bend of the
" river, and its batteries so placed as to expose a vessel to a raking
" fire as soon as it came within range, then to a direct fire from the
" water batteries when abreast the city, and a plunging fire from the
" guns on the bluffs, and then to a raking fire till out of range." The batteries were placed at the water's edge, half way up, and at the top of the bluff, 300 feet above the river, all earthworks, constructed mostly

since New Orleans was captured. The current was probably three or four knots, and the ships did not steam more than eight or nine knots. The attack commenced at 4 A.M., June 28th, 1862; the attacking force consisted of 14 wooden steamers and 16 mortar schooners; the latter during the previous day had bombarded the defences. Two-thirds of this force passed the forts, having been an hour and a half under fire, "as the batteries extended for a space of three miles" (Commander Porter's Report). 17 men were killed and 30 wounded. The flagship was hulled nine times by shot, and her rigging rather cut up. The "Oneida" was struck by three shots and one shell, the latter doing much more damage than the three shots. "Richmond" struck also by three shots and one shell, the latter doing most damage. Other damage is not given in detail; but it appears to me that the Confederates made but little use of shell, or, if they did, the powder was bad, as on the previous day a shell had lodged in a mortar vessel, which did not explode. It is curious that so little damage was done by the fire of forts scattered over a long distance, thereby preventing a concentration of fire from the ships on any one, and in a narrow river. Not having any Confederate account, the damage done by the fleet cannot be ascertained. One thing, however, is certain, as reported by Farragut, "the forts can be *passed*, and we have done it, and can do it "again as often as may be required of us, but without a land force "they cannot be taken." That this was not an idle boast is shown by his passing these forts again on July 16th, the object being to destroy the Confederate ram "Arkansas," armed with six rifled guns. This vessel the previous day had come out of the Yazoo river, defeated two Federal gunboats and a ram, ran the gauntlet of the combined squadron of Farragut and Davies from the Upper Mississippi, which had effected a junction just above Vicksburg, and probably numbered 14 or 16 vessels, heavily armed, several being ironclads, inflicted on them a loss of 18 killed and 60 wounded, losing herself 5 killed and 9 wounded, according to Colonel Fletcher (who also mentions she was manned by soldiers), and reached the protection of Vicksburg.

So dashing an affair, and so heavy a loss inflicted in a quarter of an hour by a single vessel, not unnaturally determined Farragut to attempt her destruction. With this object in view, his fleet weighed at 6.40 P.M.; the action with the batteries commenced about 7.20, and ceased at 7.50, being so near, that muskets were used as well as great guns. Owing to the darkness of the night, however, the ram could not be made out, being close in under the bluff, and hidden by its shadow. In this passage, during which some of the ships stopped engines and drifted down, the flag-ship was hulled several times, once by a shell which *did not explode*, and other vessels were struck. The "Winoa," by the first shot that hit, sprang a leak, which, after passing the batteries, compelled her being grounded, to repair it. A shell burst, killing one man and wounding two slightly. Total number of killed and wounded in fleet is not mentioned; but Admiral Davies reports it as "wonderfully small, and must be attributed to the rapid "and well-directed fire from his (Farragut's) ships, by which the guns "of the enemy were silenced as soon as reached."

On the 22nd July, another attempt was made to sink the "Arkansas." The "Essex" ironclad, from the upper river squadron, and "Queen of the West," a very fast river steamer, specially strengthened for ramming, were sent down the river, while, to distract the garrison, the mortar vessels opened fire. The "Queen of the West" was so shattered by the fire from the batteries that she had difficulty in regaining the anchorage. The "Essex" ran full speed at the ram, but, owing to her having cast off her bow-line, failed and ran aground, lying there under a heavy fire for ten minutes, when she backed off and passed down to the fleet (as reported by Farragut) "through a "storm of shot and shell, and, strange to say, not a shot struck her "after she left the upper forts, she was only struck by two shots and "*one shell*; the latter exploded inside the casemate, killing and "wounding three of the crew."

The "Arkansas" was eventually destroyed off Baton Rouge, where, owing to her engines breaking down, she was run ashore and set on fire, either by her own crew, or by the fire of the "Essex," as Captain Porter supposed; so ended her career, in less than a month after the slaughter she had inflicted on the Northern fleet.

The next work performed by Farragut and his wooden fleet, was passing, March 13th, 1863, the batteries at Port Hudson, which is situated on one of the short curves of the Mississippi, round which the current runs very strong. The historian gives no details of the batteries; but Von Scheliha remarks, that they formed a system of works superior to those of Vicksburg. The fleet consisted of three heavy corvettes, to each of which a gunboat was lashed on the port and off side, the "Mississippi," paddle, 17 guns, and a small gunboat. The "Essex," the ironclad from the Upper Mississippi squadron, was placed so as to enfilade the batteries, and there were four mortar schooners. The fight commenced at 11 P.M.; the flagship and her gunboat passed the forts successfully, although she grounded for a short time, without sustaining any great damage or loss of men. The "Richmond," the next ship, had passed the curve, and was engaging the last battery, "when a shot struck the steam-pipe in the vicinity of the safety-"valves, upsetting them both, and letting off the steam," and she was compelled to drift down the river, having been struck by twelve shot and two shells, 3 men killed and 12 wounded (the ship was ready for work next day, with reduced steam). The third ship got up to the turn, where she grounded, and remained there under a heavy fire for some time, and, on getting off, the engines were disabled by hot bearings, and she also failed, losing 6 killed and 21 wounded; being not only hulled repeatedly, but much cut up in spars and rigging. The "Mississippi," the last ship, also reached the turn, and up to the last batteries, when she grounded and remained immovable, and up to this time does not appear to have sustained much damage; but, becoming a target to several batteries which got her range, to avoid being captured she was set on fire and abandoned, sustaining a loss of 64 killed, wounded, and missing, out of a crew of 297; and as they only had three small boats to land the men on the opposite side of the river, from which musketry had been fired against

them ascending, it is evident the crew were cool and under good discipline. Although only the flag-ship and her gunboat succeeded in passing the batteries, it is evident the others would have done so, had it not been for the disablement of the engines in two of them, and the unfortunate grounding of the fourth vessel, as they had all nearly reached the upper batteries and the turning point without having suffered much from the enemy's fire, owing perhaps to Farragut's orders, as follows:—"I think the best protection against the enemy's "fire is a well-directed fire from our own guns, shell and shrapnel, at "a distance, and grape when within 400 or 500 yards."

Farragut, with his small force, did great damage to the steamers and flat boats crossing the Mississippi from Texas to the eastern shore; but his crews had to be kept in readiness night and day, to repel ram and torpedo attacks. He also had constant brushes with small batteries, in one of which, against four small guns, he had two killed and six wounded from shell which did not explode, and did not always escape loss in others.

In all these actions topsail, foresail, jib, and spanker, were kept bent—ready for use in the event of the engines being disabled—but I do not read of any vessel's screw being disabled or stopped even temporarily by any of her own gear (or any other), although spars and rigging were occasionally shot away or damaged, and one vessel lost her three masts—but I imagine only light spars for fore and aft sails. Nor did Farragut lose one of his wooden vessels from the fire of forts. Farragut's orders are concise and to the point, and useful hints are to be obtained from them. It is evident he was a leader who consulted with his Captains, decided on his plans, which were settled beforehand, and had thorough confidence in his subordinates, who appear to have had the fullest faith in him. In his general order for the river work, guns are to be mounted on poop and top-gallant forecastle, so as to have as much right ahead and astern fire as possible. Boat's howitzer in tops; ships to be trimmed by the head, to avoid swinging head down stream, if grounded; light Jacob's ladders ready for carpenter in stopping shot holes. Among the devices adopted was whitewashing deck, guns, carriage, and even block, which was found a great advantage in a night action; and other hints too numerous to mention here.

I will now turn your attention to the work performed by the Upper Mississippi squadron, mostly in the ironclads I have already mentioned as constructed there by Mr. Eads, of St. Louis.

On September 6, 1861, Commodore Foote assumed the command of this squadron, then consisting of 3 wooden vessels in commission; 9 ironclads, and 38 mortar boats building; there was no navy yard to procure supplies from, or any convenience for fitting out a squadron; but as the Secretary of the Navy reports to Congress: "All difficul-"ties were surmounted by this energetic and able officer, whose per-"severance and courage in overcoming obstacles in creating a river "navy were scarcely surpassed by the heroic qualities displayed in "subsequent well-fought action on the deck of the gunboats he had "under so many discouragements prepared."

Early in February, 1862, the ironclads were first seriously tested,

in the capture of Fort Henry on the Tennessee river. It was a regularly constructed earthwork, mounting 17 guns, 1 10-inch smooth bore, 1 24-pr. rifle, 12 32-prs., 1 24-pr., and 2 12-prs.; it was situated at the end of a long reach two miles in length. A battery of 2 64-prs. on a neighbouring eminence commanded the work.

The attacking flotilla consisted of 4 ironclads, 3 of 13 guns, 1 of 9; each vessel firing 3 guns right ahead and 2 astern; and 3 wooden gunboats, mounting 9 guns each.

At 10 A.M., February 5th, the four ironclads, in line abreast, advanced to the attack, followed by the wooden gun-vessels some distance astern also in line abreast. Little firing occurred till within a third of a mile of the fort, when the flag-ship delivered her fire, followed by the bow-guns of the three consorts; 11 guns from the fort replied with "an accuracy of aim that proved the value of the gunboats' "armour, as they were repeatedly struck." The action at close quarters lasted an hour and a quarter when, having 7 guns out of 11 disabled, and one-third of the garrison killed and wounded, the fort surrendered to the Navy; the Army, owing to a muddy road, not coming up till an hour afterwards. The flag-ship was struck 31 times, "Essex," 15, "St. Louis," 7, and "Carandolet," 6 times; the wooden vessels were not struck. Altogether 59 hits; casualties were 2 killed, 9 wounded, and 28 men scalded by an escape of steam in the "Essex," from a shot in her boiler, which entered one of the ports.

Commander Foote next attacked Fort Donalson, on the Cumberland River, a much stronger position, having 20 guns bearing on the squadron; one battery was 20 feet above the water, a second, 60 feet, and a third, on the summit of the bluff, 150 feet above the river, mounted a 128-pr.; the lower batteries mounting 32 and 64-prs. Four ironclads and two wooden gunboats attacked the fort, February 14th, the army co-operating. Fire was opened when about a mile distant, and a steady advance made till within 400 yards, when shot and shell from the fleet dismounted the guns, and drove the gunners from the lower batteries, not, however, before serious damage was done to the ironclads, three being disabled in the steering gear, compelling them to drift out of action. The Commodore, from the slacking of their fire thought that in another quarter of an hour the forts opposing the fleet would have given in; but as the forts opposed 20 guns to the 12 bow-guns, which the ironclads could only use (without having the Confederate statement), that point admits of doubt, particularly as 11 men were killed and 43 wounded in the vessels; the flag-ship was struck by 59 shots, had 2 killed and 9 wounded; the "Pittsburg" by 40, and the "Carandolet" by 35 shots, from 128 prs. to 32 prs., having 4 men killed and 32 wounded, while the "Pittsburg," although struck oftener, had only 2 men wounded—such are the chances of an engagement. The fourth ironclad was also struck, but number not mentioned; her steering wheel, however, was disabled, and she had 4 killed and 5 wounded; so I think we may infer she was struck 30 times.

These four vessels were struck 164 times in an action of two and a half hours against 20 guns; Farragut's fleet, in passing the forts below New Orleans, opposed to 100 guns ashore, and about 50 in the

flotilla, being struck 163 times. The forts surrendered next day to the Army; and Army and Navy in conjunction cleared the river of forts and hostile gunboats, till a junction was effected with Farragut's squadron above Vicksburg, where the conflict with the ram "Arkan-" sas," already mentioned, occurred.

The ironclad squadron in November, 1862, was placed under the command of Acting Rear-Admiral D. Porter, who as Commander Porter in charge of the mortar vessels had so much contributed to the success of Farragut's passages of fortified positions. On the 16th April, 1863, 7 ironclads, and 5 or 6 transports, passed the forts off Vicksburg at midnight, which had been considerably strengthened since Farragut passed down. They were two and a half hours under fire; one transport was burnt, another seriously injured, 12 men only were wounded; one ironclad was struck by nine round and rifle shot. Transport "General Price," was struck by 13 shot and shell, two of the latter exploded inside, and set the ship on fire; besides musket balls, 3 men were wounded. Other ironclads were struck by 23 shots, no mention being made of shell, and were not much damaged.

On the 29th April, Grand Gulf was attacked "with only partial "success." This was a fair stand-up daylight fight, lasting from 8 A.M. to 1 P.M., between the same squadron and "four batteries of "heavy guns, placed a quarter of a mile apart on high points com-" manding the river;" in all, mounting 13 heavy guns, mostly rifles, and some field pieces. All the ships suffered heavily; the flag-ship was struck 47 times, and had 7 men killed, 19 wounded. "Lafayette" hit by 40 shot, "five only did serious damage," and only one officer slightly wounded. "Tuscumbia," early in the action, was struck by a shell on the outer edge of the port shutter, which "opened it, "entered the turret, exploded inside, killing 4 men, and wounding "several." "Another shell struck both shutters of the same port, "jamming them so that they could not be used; another shell entered "the after turret and exploded, disabling every man but one at the "gun." "The ship was struck 81 times by shot and shell," besides grape and shrapnel; 5 were killed and 24 wounded "Mound City" silenced batteries opposed to her after four hours' firing; lost no one, and received no damage worth mentioning. "Carandolet" not injured; "Pittsburg" was struck 35 times; had 6 killed and 13 wounded.

The Admiral reports: "All the Commanders fought their ships "gallantly, and I think effectively.

"All the vessels did well, though it was the most difficult portion "of the river in which to manage an ironclad, current six knots, and "strong eddies turning them round.

"It was a hard fight, and a long one on both sides. The enemy "fought his upper battery with a desperation I have never yet wit-"nessed, for though we engaged him at a distance of 50 yards, we "never fairly succeeded in stopping his fire but for a short time. It "was remarkable we did not disable his guns, but though we knocked "the parapet to pieces, the guns were apparently uninjured." It was indeed a severe action, three of the ironclads being struck 163 times,

and having 18 killed and 56 wounded, while it is curious the "La-"fayette," although struck forty times, had not one wounded. Between 7 and 9 P.M. the same evening, the fleet protected the passage of the transports down the river, and were engaged an hour and a half; struck about a dozen times; one man was killed; other damage done not worth mentioning.

Here again we want the Confederate account, to enable us to arrive at a just conclusion, as the forts were abandoned (owing to the Northern Army getting into their rear), and taken possession of by the Navy; ruined, according to Porter's account, which, however, hardly seems to agree with the fact, admitted by himself, that the fire was not silenced in the morning fight of five hours, and also his vessels were struck when passing down in the brief night action.

The next action I shall describe is Farragut's passage of the defence to the entrance into Mobile Bay, defended by Fort Morgan, originally a brick structure, supplemented according to the recent experience gained by the Confederate engineer, by sand batteries, &c., mounting 136 guns, and a line of torpedoes extended partly across the channel. Here great additions were made to the original masonry defences, while, with the exception of four monitors, the attacking force was no stronger than in the passage of Forts Jackson and Philip, two and a half years previously.

The "Tennessee," a powerful Confederate ram, plated with 6-inch iron, armed with six rifled 6 and 7-inch guns, and three gunboats, about a match for the same number of Farragut's gunboats, lay inside the defences, ready to attack the Northern fleet, as it was presumed they would be seriously injured or disabled in passing such formidable defences. The fleet consisted of five corvettes, mounting 20 guns on an average, and three mounting 16, each having an attendant gunboat lashed on the port or off side from the batteries, and the four monitors were placed in-shore. On the engaged broadside therefore the Federals opposed 74 guns to the fire from the batteries, mounting, as already mentioned, 136 guns. I cannot, however, ascertain how many bore on the channel; but as the passage had not been attempted sooner, there must have been a considerable number, as so dashing a leader as Farragut declined attacking without monitors. I don't think I am overstating the case when I allow at least 50 guns; and as all the ships' guns could not bear at once, in this instance I do not think their fire was superior in point of numbers to that of the defence, supplemented as it was by a raking fire from the "Tennessee" and her consorts. Farragut, as usual, relied on the rapidity of his own fire as the best defence against the enemy; not to fire till they did, then use shell and shrapnel; grape when within 400 yards. Gun crews on poop, forecastle, and in tops, were to be removed when within grape range, till passing it. His Flag Captain reports after the action, "The rapidity of our fire, together with the smoke, so com-"pletely disordered the enemy's aim—we passed the fort with no "great injury or loss of life—a shell, which exploded, killing and "wounding a large number of men at No. 7 gun."

The action commenced at 7 A.M., August 5th, the "Tecumseh"

leading monitor, about 300 yards on the starboard bow of the "Brooklyn" leading; the wooden line was blown up by a torpedo; the "Brooklyn," to avoid others, stopped and backed, and would have clubbed the fleet, when defeat would have been inevitable, but for the prompt decision and judgment of Farragut in the second ship, who dashed ahead, despite of torpedoes, full speed, followed by the whole fleet, and by 8 A.M. the fleet were anchored inside the defences, and beyond their range.

It appears to me that a disastrous defeat was converted into victory by (in so unexpected a contingency) the quickness of eye and power of rapid decision Farragut possessed, which saw at a glance the only escape from the dilemma the fleet were placed in, and which can only be acquired by a thorough practical knowledge in the management of fleets, and for want of which no amount of theoretical knowledge, however desirable in many respects, can make up for in the moment of difficulty.

The fleet were scarcely anchored when the "Tennessee" was seen advancing to the attack (the other gunboats had been previously disposed of), and now commenced a fight unprecedented in its nature—one ship against nine, three of them monitors. The unequal fight lasted from 8.45 to 10 A.M., when the "Tennessee" surrendered, her steering gear being disabled, funnel shot away, the Admiral and six men wounded and three killed, and the rest of the crew "half suffocated "by the smoke, half stunned by the ramming of the wooden ships, "and blinded by the *blast of bursting shell.*" One monitor, armed with a 15-inch gun, was the only one whose shot penetrated the armoured casemate of the "Tennessee."

The total loss of the Northerners that day (exclusive of the 120 blown up in "Tecumseh") was 52 killed and 170 wounded—48 killed and 136 wounded being in the four leading ships, which also bore the brunt of fight with "Tennessee." There were no casualties in the monitors. At least two-thirds of this loss was caused by the ram and gunboats, Farragut reporting "we lost many more men from their "fire than from that of the batteries of Fort Morgan."

They were only struck by 120 missiles; for the number of hits, therefore, the casualties are greater in proportion than in any previous action of Farragut, and which I attribute in great measure, as was the case, to the "Tennessee" and her consorts using shell. In a paper written by Captain Cyprian Bridge, on "Naval Attack on Fortresses," he gives a passage from *Lessons of War*, quoting the high authority of Sir William Jervois, R.E., that "a fort is able to inflict far greater "damage on its assailants than the latter can inflict on it, whilst it "will hit the assailant nearly every time; the chances of the assailant "hitting it more than once in the same spot are small. Further, one "shot may send a ship to the bottom, whilst the fire from a ship "during action is more or less inaccurate." I can only imagine this opinion to be purely theoretical.

And now for some of those stubborn facts which so frequently annihilate theories. The "Tennessee" in an hour and a quarter killed and wounded over 100 men, which is giving credit to the fort and her

consorts for the remaining 84, and I believe, from the reports, I am within the mark. The "Arkansas" ram, as I have already mentioned, killed and wounded 78 in less than a quarter of an hour. The "Albemarle" another Confederate ram, with only two guns, one of which had its muzzle shot off, engaged eight wooden gunboats for three hours. "Many men were killed, wounded, and scalded on board the Federal ships (one of which was disabled)." The actual number is not given. The "Alabama" sank the "Hatteras" in half-an-hour in a night engagement; was herself sunk by the "Kearsage" in an hour and quarter, having 9 killed and 24 wounded, the "Kearsage" being hit 28 times—both ships in rapid motion. The "Weehawken" monitor at sea fired five shots at the "Atlantic" Confederate ironclad, four of which struck and decided the action in a quarter of an hour. The "Merrimac" struck the little monitor 28 times, and was repeatedly struck by the monitor's two guns—both vessels in motion. I have traced the loss of twenty-three Federal vessels during the war, three only were sunk by fire of batteries when afloat, and three captured by artillery fire when aground in narrow rivers, while six of them were captured or destroyed by Confederate vessels, five were blown up by torpedoes, and for one engagement with ships, there were fifty or more with batteries.

Now, for the fire of batteries against ships, and *it must be remembered in narrow rivers with strong currents* and marks on the opposite shore to guide the gunners. In addition to the actions I have already described, Captain Ward, in a paddle steamer of 250 tons and three guns, with two smaller consorts of each two guns, the largest a 32-pounder, engages batteries in Acquea Creek, and was struck several times but sustained little damage, reports more than 1,000 shots were fired at them within range.

In the combined siege of Port Hudson, the "Essex" ironclad, 9 guns, was engaged repeatedly from 23rd May to 26th June with batteries mounting two 10-inch, two 8-inch Columbiads, and two rifled 6-inch guns. "During these engagements 'the batteries were silenced and 'men driven from them three times.' 'Essex' fired 738 shells, and mortar vessels 2,800 shells. It was estimated 1,000 shot and shell were fired at 'Essex,' twenty-three struck her hull, and her awnings and windsails were cut up—casualties, six wounded." Comment is as unnecessary as it would be to give the many more similar facts I could bring forward, while I have given the worst done by batteries as far as I have ascertained. Mr. Goschen, as every one probably remembers, stated in the House of Commons that he was informed by an eminent authority that it would take 300 hits to reduce the "Inflexible" to the well-known "riddled and gutted condition." From these facts we can all judge how very improbable such an event would be, and how many shots must be fired before she would be struck so often.

I have not alluded to the attack on Charleston and Fort Fisher, as they were more regular sieges; nor does space permit of the narrative of many other most interesting events in the war; but I must briefly allude to the extraordinary escape of Admiral Porter's fleet from the Red River, up which he had ascended to support the Army, and on

their repulse and retreat found himself above the falls of Alexandria with the river falling instead of rising, and the Confederates turning the course of streams that fell into the Red River. Porter saw no alternative but to destroy his vessels and retreat with the Army, when Colonel Bailey, the engineer of the 9th Corps, proposed building a dam across the river above the falls so as to raise the water sufficiently to float the vessels over the rocks. Ridiculous as the plan appeared to most of the engineers, it was adopted and succeeded. It was in undertakings like this that the previous civil life training of the greater part of the Federal Army gave them advantages no European Army could possess. Amongst the Army were three regiments of lumbermen from the State of Maine, who soon cut down timber sufficient, and the resources of the whole Army were at Colonel Bailey's disposal, who evidently must have had previous experience in damming rivers, and in ten days did what Porter states would have taken any private company a year to do. So far I have mostly given facts about which there can be no dispute; but as different conclusions will most likely be drawn from them, I shall now proceed to give my own observations. However, for want of Confederate accounts, I am more in the position of a lawyer advocating his client's cause than of a judge summing up after hearing both sides. It is evident, as the Federals were eventually successful in nearly all their attacks on forts, that there must have been a weak point in the Confederates' armour, and one, and a very material one it appears to me, was that they used *solid shot* while the Federals used *shell*, shrapnel, grape, and canister almost entirely.

In many actions the expenditure of ammunition is given. At Grand Gulf, of which I have given a brief account, the expenditure of the flag-ship was 337 shells, and 8 solid shot; "Lafayette" 248 shells, another vessel 418 shells, two others report 429 and 216 rounds, projectile not named. The squadron was struck 163 times, but mention is only made of three or four shells.

The "Tuscumbia" was struck 81 times. One rifle shell struck a port shutter, opened it, exploded inside the turret, killed four and wounded several men; another shell jammed a port shutter, preventing that gun being used for the rest of the action. I have already drawn your attention to the effects of some shells, and the damage done by them. One 7-inch shell from a Confederate vessel hit the "Massachusetts" five feet above the water-line; it cut through eighteen planks of the main deck, carried away tables, sofas, eight sections of iron steam-pipes; exploded in state rooms, stripping the bulkheads of four and setting fire to the ship. A fragment of the shell hit a timber, breaking all the outside planking from the main to the spar-deck, a distance of 5½ feet. Had it burst nearer the water-line, it is evident the ship must have gone down. From the accounts given of those hits by shot and shell, I believe I am much under the mark when I say for one shell, ten shots were fired by the Confederates, and on an average each shell did more damage than five shots when they did explode, which was often not the case. I have already mentioned Farragut's orders relative to firing shell, and in the many returns of ammunition expended in his squadron I scarcely find mention made of

solid shot. I was much struck with the remark relative to the capture of the "Tennessee" by Captain Hamilton of the late Confederate States Navy in a paper read here June 1st, 1868 (which I only recently obtained), viz., that the men were "blinded by the blast of bursting "shell," which it must be remembered were 11 and 9-inch, with bursting charges of about 9 and 5 lbs. of powder, exploding outside the casemate, for none penetrated.

In the action between the "Alabama" and "Kearsage," Semmes, finding his shell did not explode, fired shot, and only wounded three men in the "Kearsage" by a shell which exploded, although she was struck twenty-eight times. The "Kearsage" fired in all 173 rounds, 55 of which were from her 11-inch shell guns, which killed 9 and wounded 24 of the "Alabama's" crew before she sank in consequence of the huge gaps made in her by the heavy shells from the "Kear-"sage." The Confederate shells were also of inferior manufacture, judging from the fact that of the comparatively few recorded as striking, several did not burst, although doing considerable damage as shot.

Another weak point evidently was the inferiority of the Confederate Navy, which, with the exception of the rams, mainly consisted of weak river steamers, scarcely protected against shell. At New Orleans at least six were set on fire by Federal shells. The "Brooklyn," of twenty 9-inch guns, mentions, after passing the forts, "we engaged several of "the enemy's gunboats at short range, from 60 to 100 yards, the "effect of our broadside must have been terrific." As no mention is made of the effects of the fire from the gunboats, I cannot but think they must have been inadequately armed; and as only about 250 naval Officers joined the Confederates, they at all events could not have been properly officered. Colonel Fletcher states most of these were equipped by the city of New Orleans, as well as the ram "Louisiana." They were manned by volunteers and under no discipline, and did not acknowledge the naval Officer, Captain Mitchel, sent to command them at the last moment. Porter reports there was great ill-feeling between them and the military at Forts Jackson and Philip. I must, however, express my opinion that they fought gallantly. At Fort Pillow, out of eight Confederate vessels two were blown up and one sunk by shell in less than an hour; and soon after, at Memphis, two were blown up by shot or shell in their boilers, one set on fire by shell. In these two actions only seven were wounded in the Federal squadron, two vessels damaged by ram, but none struck by shot, proof of the inferiority of the Confederates, except in numbers, while 300 shot and shell were fired against them at Memphis alone. Excepting the seceding Officers, the Confederates had not the nucleus of a Navy, and found it impossible to form one during the excitement of war; but their gallantry, as was to be expected from men of similar race, was not surpassed by the Federals, more especially when we consider they only met to be beaten. These weak points of the Confederates I gather from the Federal accounts. Many more would probably be obtained had we Confederate reports; and I cannot help thinking that had the Confederates used more shell and possessed

more efficient vessels, the Federals would have sustained very much more damage than they did, not that anything detracts from their merits; their plans were well and maturely considered. Mutual confidence existed between the leader and his subordinates, and dash, decision, and energy were shown at the right moment.

It may not be out of place here to mention, relative to a remark made by some one, that while the word glory is the most prominent one in Napoleon's despatches, duty is that in Wellington's despatches. I do not find the former word in the Federal despatches. Commander De Camp, after New Orleans, reporting the loss of five killed and twenty-four wounded, observes, "The highest praise I can bestow on "the Officers is to say they all did their duty." Farragut's mentioning his second in command at Mobile, "as never forgetting to do "his duty to the Government," adds, "he carries out the spirit of one "of Collingwood's best sayings—'Not to be afraid of doing too much, "'those who are, seldom do as much as they ought.'"

Every commander of squadrons or ships reports in a similar manner.

The conclusion I arrive at from these facts, and others beyond the limits of a paper, are—

1st. Shell must be the rule against forts and unarmoured vessels, solid shot the exception. Shell demoralizes where it does not penetrate. If the men of the "Tennessee" were blinded by the blaze from the explosion of 9 and 11-inch smooth-bore shells, the probability is the explosion of 10 and 9-inch rifle shells, with bursting charges of 27 and 20 lbs. of powder, must have considerable effect on the crews of ironclads, even if they do not penetrate. In my opinion, founded on these facts, our present establishment of shell is insufficient for the demands that will be made on it; except for special circumstances, solid shot should not be used.[1]

2nd. In attacking forts under weigh, very close order must be kept. Farragut passing Vicksburg remarks—"If the ships had kept "in close order, in all probability they would have suffered less, as "the fire of the whole fleet would have kept the enemy from his guns "a longer space of time, and when at his guns his fire would have "been more distracted."

3rd. If hydrography permits, pass and re-pass the forts at various distances previously arranged, by which your own time-fuses can be fitted while the enemy will have difficulty in getting your range, ships not to follow in each other's wake, as at Port Royal, where the fleet escaped damage, while at Fort Donalson and Grand Gulf, where they could not vary their distance, they suffered considerably.

4th. A powerful ironclad navy, with numerous vessels of light draft, ought in time to capture forts isolated from the main land and unable to get in fresh troops, as was the case at Hatteras, Port Royal, Island No. 10, New Orleans, and other places not mentioned here.

5th. Water defences with an army in rear can only be taken by a

[1] Since writing this, I find the proportion allowed is much greater than it was.—R. V. H.

combined army and navy attack, as Vicksburg, Port Hudson, and others.

6th. A good corps of surveyors is essential, as Porter reports, and as our practical experience also tells us.

7th. In all coast defences against ships, naval Officers should be consulted on the position of the forts. Porter says—"Had the Engineer "Whiting known anything of the hydrography of the outer bar (at "Wilmington) he would have placed Fort Fisher a mile inside where "he did, where it would have been unassailable by ships, and have "equally commanded the approaches." Captain Bridge, in his paper previously referred to, mentions, from his own knowledge, a case of a fort in the White Sea built specially against ships, which was attacked by one of ours from a position where scarcely a gun could be trained against her.

At this present moment the defences of some of our important Colonial seaports have been settled by two eminent Officers of the Royal Engineers.

It is certain that if attacked, the Officers of that corps will not have to defend them, while it is more than probable the Navy may. I may be mistaken, but I do not hear of any naval authority having been consulted as to their position; none were on the Commission.

8th. Captain Bridge has pointed out, as I also gather from these facts, that at the outbreak of a war, the maritime defences will probably be in a backward condition, and that therefore the sooner an attack is made on them the better prospect is there of their being reduced, "and that an enterprising enemy has the chance of unpre-"paredness on the part of the defence, if on his side he lose no time." On this point we may take a lesson from the Russians, who are preparing privateers to prey on our commerce, and they may succeed at first, but their career will soon be over; our defence will become too strong.

And now to conclude. When we remember that in 1814, with a population of 18,000,000, we had 147,000 seamen and marines, 114 line-of-battle ships, with a proportionate number of smaller vessels in commission; and that the Americans in three and a half years increased their Navy from 42 ships to 700, and from 7,000 to 51,000 seamen, I do not think the resources of the country would be over-strained with our present population of over 32,000,000 if we trebled our present force of 60,000 seamen and marines, as rapidly as ships could be built for them, should war unfortunately be forced upon us: and I am sure, notwithstanding the honourable member for Hawick's speech to his constituents some months ago, not one of my naval hearers, nor military either, if any be present, but would prefer peace for the country to any chance of personal aggrandisement.

Captain Colomb, R.N.: I suspect that one reason why members are slow in rising to discuss this paper is the enormous mass of facts it has brought before us, and the difficulty of digesting them sufficiently to form any distinct conclusions as to the lessons we should draw from it. I shall merely advert to one or two of the points which occurred to me in the reading of the paper, premising that a discussion on a paper of this kind is one which I should like to see adjourned in

order that we might think it over, and then be in a better position to discuss it. That it is of great importance I am quite certain we are all agreed. We have here not the theories of book-worms, but the actual work of men who were fighting for the great prize of victory, who did on both sides the best they could, and who performed, so to speak, experiments from whose results we in this country, if we are wise, shall draw the necessary conclusions, and follow out the steps to which these conclusions lead us. Information as to the results of the American War, so far as I am aware, is only to be gathered here and there. I had not heard of the work which has been especially adverted to by the lecturer, but I have always observed one gets a fact from one book and another from another, but we do not get such facts as we want in a concise form so that we can deal with them. We have now got them for the first time, as far as I know, in the paper which has been read. Our attention is drawn, in the first instance, to a very important lesson. The Northern success, the lecturer has shown us, was in the first instance due to their actual possession of the naval field. They actually had the Navy in their possession, and there was very little secession from the Navy of the North to the Southern side, so that the North began with a strong navy in comparison with that of the South. Now we have to recollect that so far that is our position here in England—we begin in any war with that strong navy which the Federals possessed. The next lesson which struck me was the enormous speed of production which can be got up when pressure is brought to bear. At the present time there is no more common point of discussion amongst naval Officers than the assumption that the days of large fleets and large assemblies of fleets are passed. Since my return to England, if I have heard it said once by competent naval Officers I have heard it said a hundred times, that the days of gatherings of large numbers of ships together are passed. I hold exactly the opposite view. Because ironclads are expensive, because they take some time to build when we are only building in dockyards, and because there are few rolling mills, and so on, we say that it is impossible that large fleets can be brought together. I think the lesson to be drawn from the early part of the paper is, that that is all nonsense, that if you go to war, and it is necessary, you will have in a very short time most enormous fleets; much larger than we had in the Crimean War or in the wars of the French Revolution. I look upon that as a perfectly distinct fact which we should never lose sight of. I was not aware until I heard this paper read of the relatively greater force of ships as regards land forts. I had held, putting aside the question of ironclads, that it was even established in America by the American War, that as a general rule the ship was inefficient as against the fort. While I had, on the other hand, always understood it was an axiom that a fleet could always run the gauntlet of any number of forts, I thought that that was the point established by the American War, but I did not quite see that the forts could be actually reduced and their fire suppressed, although, as the lecturer pointed out, they could not be taken possession of except by an army. I think that is a most important point to dwell upon; I have held myself that now in the days of ironclads most existing forts are destructible by a sufficient force of ships, and a great many of those forts that we could not satisfactorily destroy in the old days of wooden ships, might be quite satisfactorily destroyed by the modern ironclads. The best method of attacking forts was clearly set out in the attack on Fort Beauregard; the ships formed in line ahead, and passed at different distances backwards and forwards successively, and in close order, the effect being that any single fort receives broadside after broadside with intervals of only a few seconds, while their reply of course depends upon the time it takes to prepare and relay their guns, so that a fleet gets that advantage—in point of fact the fleets "double on" the forts. I was very much struck by Admiral Farragut's opinion of the effect of offensive fire as a defence, and it is a point which I have often thought over myself. After all that has been said and done, it may be better to have an effective attack, and to trust to that effective attack for your defence. Is it not better that you should lay primary stress on the attack and less stress upon the simple defence, because if your attack is sufficient, your enemies will not stand to their guns, and therefore you will have that defence? I very strongly agree with the remark of the lecturer that all study, science, and theoretical arrangements for manœuvring fleets are as a mere nothing compared to the practical working of them. No man can know what can

be done with fleets till he has actually got into the ships themselves, and has seen them moving, and has known within what limits they can move. I do not mean to say it is not well for him before he undertakes that office to have some knowledge of the theory of the question. There is one thing which we possess in the Navy, and lay great stress upon, it is a point which bears very much upon the successes of the Federal Navy against forts, that is our rapidity of fire. I was once very much struck by the remark of a military Officer present on board one of our ships in the attack on some of the forts in Japan. He was talking over the matter with me, and he simply ridiculed our rapidity of fire. There was nothing I could say that would persuade him to the contrary. He was assured that we were wrong; the thing was, in his opinion, to have a slow, deliberate, and quiet fire. We, on the contrary, say, "Get accuracy, but always combine it with rapidity;" and the rules for our prize firing in the Navy are perfect on that head, we say to the competitors, "Get "your accuracy, but if you take too much time over your accuracy the prize will be "withheld from you." Rapidity is nearly as important as accuracy, because it is not altogether the question of hitting, it is the question of demoralization; and if you burst shells over ships or forts, you demoralize the crews of the guns; they make bad shots; they become unhinged; they do not quite understand the orders they receive, and by the establishment of what school-boys call a "funk" you actually win the battle. Your battles are not gained by the destruction of human life, they are gained by nerve-disturbance. If you can destroy your enemies' nervous force, you gain your victory, not by killing and destroying him. Soldiers and sailors will, of course, always dispute as to the value of the fort against the ship, and the ship against the fort, each side will say that there is nothing like his own particular leather, but I do agree most strongly with the lecturer in saying no sea-batteries should ever be placed by any persons employed by the English Government unless naval Officers are in communication with them, and have an equal voice in the placing of those forts.

Admiral Sir LEOPOLD M'CLINTOCK: With your permission I should like to ask the lecturer whether he can give us any further information with respect to torpedoes; he only mentioned them as being successfully used on one occasion; and also as to the amount of damage received by the earthworks. It appears that the gunners were driven out of the earthworths, but it does not appear that the earthworks were destroyed or scarcely damaged by the fire from the ships.

Lieutenant-Colonel E. W. CHILDERS, R.A.: Perhaps you will allow a soldier to speak for one moment on this subject. All I want to do is to confirm what the lecturer and Captain Colomb have said as to the great necessity for the assistance of a naval Officer in order to prepare forts for the defence of sea coasts. On one occasion I was directed by a foreign Colonial Government to form one of a committee for the defence of a very large town. In the first instance, we got large instructions as to the fortifications we were to draw up. The plan of fortification was so large that we asked whether we were to have unlimited funds? They told us to defend the place in such an elaborate manner that we thought fortifications would not be required at all, that with the men they had got at their disposal, or might have at their disposal, they might defend the town by an Army at a very much cheaper rate than by the fortifications we should have had to prepare for them. The answer we got to that evidently showed that they really did not know what they did want; but they said we might drop the land fortifications, and might draw up a plan of sea-fortifications which would render the place impregnable against any armour-clad fleet. You will admit that that was rather a large order, but at our first start-off we found that, having no naval Officers on our committee, we were not fully aware what the strength of an armour-clad fleet would be when brought against that town. We drew up a plan of fortifications as moderate in price as we could possibly make it, and, in sending it in, explained that it was possible we might have made it a great deal too strong for the necessities of the case, and that we might also have made it too weak; but without the experience of a naval Officer we could not decide that point. I therefore would wish to confirm what has been said by the lecturer and by Captain Colomb. I may also add that in that particular station where we were, I suppose it would have been extremely difficult to have procured a very experienced naval Officer to have helped us; but it would have been well worth the

trouble and expense of getting one from some distance. I should like to say one word with regard to forts and ships. I suppose there are certain circumstances under which ships could not be used for the defence of places; you must defend by forts, but after a very long experience in this matter, and having been engaged on committees for the defence of two seaports, I think it is possible that ironclad floating defences might be made a very prominent portion of the defence of every seaport. With regard to the wonderful revelation we have heard to-day, which I must also say is a revelation to me of the extraordinary way in which the Americans on both sides disarmed land forts by the fire of ships, and as it appears really under a superior fire in many cases—for we find that inferior ship's fire silenced superior land fire—I cannot help thinking it is greatly due to this fact, that their Admirals and Captains were not in any way afraid of consequences. I cannot help feeling that an English Officer at sea, very like an English Officer on land, fights very often with one hand tied, and that the real secret of these wonderful successes was that Admiral Farragut, having made his preparations, was not at all afraid to lose a certain number of ships in order to carry out his plans.

Captain VERNEY, R.N.: For my own part I think the profession owes a great debt of gratitude to Admiral Hamilton for the way in which he has condensed so ably these accounts of the American actions, and it would be very much to the advantage of the profession if he could be induced to enlarge it in the shape of a pamphlet, giving still further details instead of being obliged to condense it into the short space necessary for a paper to be read before this Institution. There is one thing with reference to the manœuvring of ships against land forts which has not been brought out, and which I think of the utmost importance: that is that naval Officers should have every opportunity of knowing the powers of their own ships. The question is sometimes asked me why there are ever accidents in the Navy when you have highly trained and experienced men devoting their lives to the Service, why there should ever be mishaps? It is pointed out to me that with merchant ships some companies never have any accidents whatever, and why should there be any in the Navy? There is one way in which we are under a great disadvantage in the Navy. Merchant Captains are accustomed always to handle their ships at full speed, but in the Navy we very seldom have the opportunity of handling our ships at full speed. If ships are to be engaged with land forts it must often be while they are at full speed, and above all the Captain must be able to judge the space in which his ship will turn. If they are to turn round and come back again, and there is shallow water on each side, the Captain should have the most absolute certainty so as to be able to tell by his eye exactly the circle his ship will describe at full or half speed, or with half or all the helm. He must know that with absolute certainty. My own opinion is that we do not get a fair chance in the Navy of exercising our ships at full speed in turning and manœuvring. We sometimes have fleet evolutions, but they are so very expensive that they are not sufficiently encouraged, and certainly in that matter I do not think enough is done to enable Captains to handle their ships in narrow waters. This question of handling ships against forts is one of the utmost importance, and I do not think we in the Navy have sufficient opportunities given us to know how to handle our ships.

Captain COLOMB: I should like to correct an impression which might be caused by the remarks of my friend Captain Verney. I think I am not mistaken when I say it is laid down in the instructions, which every Captain possesses, that he is to make himself acquainted with all those matters of which Captain Verney has spoken. He is told distinctly to ascertain those facts for himself, and if he does not do it the responsibility lies upon him. He is told also to use blank cartridge for ascertaining the effect of smoke, and, in point of fact, to make all necessary experiments. I am quite aware that we do not always make them, and I do not think we are altogether to blame for it; but we do not do it because we are not so alive to the importance of it as Captain Verney rightly is.

Mr. SCOTT RUSSELL: I quite agree with the previous speakers that this is so valuable a paper that it is scarcely possible, with due regard to its merit and value, to discuss it adequately. There are, however, one or two points which Admiral Hamilton has been good enough to put to me, to which I must reply. He seems to think, and he thinks admirably, that the resources of this country for creating,

under circumstances of great difficulty, a large and efficient fleet, are greater than the resources of any other country for the same purpose. I frankly admit that, but let me add, that the needs of this country for a very enormous fleet are also far greater than those of any other country, and the question is, not as it is very often put, whether we are as ready as other nations are, and as well prepared, and as thoroughly armed as other nations are. That is not the point at all. The point is, are we as ready and well prepared in proportion to our needs and in proportion to our duties, which are far beyond those of any other nation? It has rather been a rule in discussions here, not to criticise our fleet as it is, but with regard to our preparations for the future. Let me mention, that during the Crimean War I had a great deal to do with the preparation for the future, and I am sorry to be obliged to tell you, that in the Crimean War, in our naval affairs, we were quite ready when the war ended, and it was then too late. Now, I am afraid, that if you rely too much on the resources of the country, you will be quite ready when it is too late. At the same time, permit me to say that you have seen in the newspapers, and I believe it is quite correct, that Russia, early in this year, determined to have 100 very fast torpedo vessels. I think I have reason to know that that hundred will be quite ready about the 10th June, and, therefore, after the 10th June, something may happen. If Russia, without English assistance—with considerable asssistance, but without English assistance—has been able in, I think, about four months, to get a fleet of 100 torpedo vessels ready for efficient action against somebody, perhaps or perhaps not, I think it is a rule-of-three question, which you will easily settle, how many torpedo vessels could all England create in three or four months? I think the figure would be a very large one. Therefore, in that figure I would entirely confirm the statement of Admiral Hamilton, that we have amazing resources. But I fall back upon an admirable phrase which he used very early in his paper, the phrase in which he attributes much of the success of the Federal fleet to the fact of the Government of that country "having long before made up its mind as to "what it wanted," and to the Admirals and Officers of that fleet having very thoroughly "made up their minds beforehand as to what they intended to do." Now, I believe that that condition, that the Government of a country should have in its head a clear plan of a fleet long before it is wanted, is most important; and, secondly, I would advocate strongly what Captain Verney proposes, that the manœuvring and handling of a fleet should, at any cost of time, trouble, and money, be brought to a far higher degree of perfection than it now is, for I am satisfied, from experience, that we have many ships that will not obey the will of the Captain, however strong-willed he may be, and it is those ships that will disobey the will of the Captain that will be the great difficulty and danger for England. On another point I am extremely glad Admiral Hamilton has brought out this conclusion, which I have often, as a pure piece of theory, proposed in this room, but I do not know if it has yet been efficiently carried out—I mean for the Navy—the enormous benefit of large shell guns as distinguished from mere shot guns. My opinion is, that in the modern Navy, mere solid lumps of shot, whatever they are made of, whatever their penetrating power, do contemptibly little harm, and I believe the great instrument for the Navy will be, what we have so often discussed here, a shell gun of larger bore than at present. Then another point comes out, which is of great value, that our ships, if possessed of quick manœuvring (and that is a great point), and if thoroughly trained to quick manœuvring, will have such a power of fighting the large, powerful guns of land batteries, that I attribute much of their safety to that point. I believe, that although the land batteries possess a great power of aiming, yet the fact of the varied motion of fleets is the best means of opposing the land shot. The other point to which I would call attention is this. I think that these American vessels, being able to fire three of their guns end on—for that is quoted as one of their qualities—is a very important quality, for you must remember, that in attacking a land battery, coming end on is probably the very first part of the manœuvring. You remain end on for a long time, and, therefore, you may almost say that the end-on fire of a ship is a great measure of that ship's efficiency. Manœuvring power, large-bore shell guns, great experience in manœuvring, as many guns end-on as possible; I think these are the great points in a fleet. And the next great point in a fleet, I should say, would be having at least four entirely

distinct fleets composing one fleet. By that I mean that there are at least four entirely different classes of vessels, which four classes together form an efficient fleet; and if I were asked, what is the greatest want for the future in the Navy, I would say, the greatest want of the future,—and the sooner it is supplied the better,—is those four classes of vessels, with their different degrees of armament, different speeds, and different draughts of water, all ready to be incorporated together into a single fleet. I am afraid we have not completed that yet, and I am afraid, until that is completed, the ideal of a naval engagement will not be carried out.

Rear-Admiral JASPER SELWYN: I find a little difficulty in discussing this paper since Admiral Hamilton has really put before us a large number of very carefully collated, highly elaborated facts, and we are not called upon to discuss those facts, so much as the lessons generally to be derived from them. The first title of the paper, as I understood, was "Lessons to be derived," and there is certainly a great deal to be derived, as Admiral Hamilton said, but we must not fail to recollect that we have several disturbing elements in our decision. The first is, that on one side during that war there were a large number of trained gunners, and on the other side very few. The second is, that these operations were conducted with known currents: they were conducted in smooth water, and in places where ships could not be seen at a great distance, and in order to show you what effect that may have, I will tell you what took place the other day in the East. Admiral Hobart Pasha took the Turkish ironclads across to have a look at Sebastopol. When he got within 6,000 yards, he saw the heliographs flashing from fort to fort. Just as he had shifted his helm and changed his ships' course, there plunged into the water simultaneously from those forts, most of them having 38-ton guns, a mass of iron, which, had it come on board, would have sunk his ship. The modern plan of plotting out harbours and their vicinity into squares, and the use of electricity for the firing of guns, has given us very different conditions from those which formerly obtained. That plan I first saw—I believe it was immediately on its inception—in the hands of Lieut.-Colonel Moncrieff, who has done more to solve the two questions of attack and defence on the coast than any other man I know. He has also shown how to do what was not done in those cases, he has given us a power to place the heaviest guns in separate pits, and yet, with all-round fire, utterly invisible to an attacking fleet. We have tried lately some experiments at Eastbourne, where we endeavoured, for a whole day, to land a shell in one of those pits and did not succeed. Unfortunately facts and discoveries come so fast now-a-days, that facts as old as those of the American War must be viewed under these different lights of science, or a due value is not given to the facts on one side or the other. There is also a fact with regard to the guns and their employment at the present day, which we did not then obtain. We have, wisely or unwisely, resorted to slow-burning powder, and in doing so, where we formerly produced nearly all carbonic acid, as the result of complete combustion of powder, we now produce an enormous quantity of carbonic oxide, which makes a yellow smoke almost impenetrable to sight, which, although it may shield the shipping from fire, yet prevents their correct aim, and, I think, that is a disadvantage in most directions, since the masts of the ships will afford a better mark to the gunners on shore than the forts will to the gunners on board the ships. A large number of these defences were not such defences as are now known to be the most effective for rifled guns. Very highly-placed guns on bluffs are, of course, most annoying to ironclads which have to pass them, since their armour offers little protection against a plunging fire. I entirely agree with the gentleman who spoke on the defence of ports. There is no doubt whatever that movable forts, in the shape of ships specially built and calculated for that purpose, something like Mr. Elder's vessels, would be the most formidable batteries that could be opposed to ships. They would be very largely invulnerable, very easily movable in light draught of water, and carrying very heavy guns they would be a very much better thing for the modern defence against the modern offence, than any casemated fort. I do not doubt that casemates will continue to be used until the first 38- or 80-ton guns are fired against them. Then we shall discover how unwise we have been to rely on the size of guns existing at the time for the measure of a defence, which may be utterly inoperative against the next year's gun. Sir Edward Belcher, many years ago, in speaking of the defence of one of our own

Channel Islands, said that he was asked to go and look at the defences after the engineers had erected them, and he being an hydrographer, immediately ran the little steamer in which they went across, within 500 yards of the fort, in a place where not a single gun could look at her. That shows the value of a naval Officer's appreciation of the way he means to attack being communicated to the engineer Officers before they plan their forts. With regard to Captain Verney's observation, as to the manœuvring of our ships, I have also regretted with him, that the expenditure of coals is so distasteful both to the Admiralty and to the Officers who command ships, and who wish always to keep them in a state of perfect efficiency, that we do have much less manœuvring than we used to have, and it is desirable that it should be increased. I think this year will show the world that whatever coals we carry can be doubled in effect by very simple means. The boilers which have been spoken of here by Mr. Perkins, are now in full process of application to ships, and there will be, in the course of a month or two, a steamer of 800 horse-power running down the Thames with that boiler on board. I may say, for the information of the meeting, they will burn rather less than 1 lb. of fuel per indicated horse-power per hour. Thirteen years' experience of one stationary land engine has shown an expenditure of ¾ lb. of fuel per hour. With regard to an observation with which the lecturer concluded his paper, it has been said, and I am afraid it has been credited by some persons, that naval Officers are anxious for war. It has been stated by an authority who ought to have been ashamed of such a thought. I have no doubt whatever, what the lecturer has said will be felt most deeply by the whole profession. We know too much about the horrors of war ever to desire it. We do our duty when the nation calls upon us to do it, but it is with regret and with a full knowledge of the dreadful effects of what we are called upon to do. No man, who calls himself an Englishman, ought to get up at a public meeting and make any such assertion.

Commander CURTIS: I only want to mention one thing, and that is, that so lately as the Crimean War, the Wasp[1] battery drove off the "Albion," and, I believe, the "Terrible." It contained eight guns in a pit. The ships were 1,400 yards off, and while the battery was not touched they were obliged to retire. "Albion," "London," "Terrible," "Sampson," and "Arethusa." The attack on the Telegraph and Cliff batteries was a total failure, they beat the above ships off with several casualties.

General ORFEUR CAVENAGH: I think the lecturer has clearly shown that a squadron with preponderating and rapid fire need not fear, under present circumstances, to attack isolated batteries and forts, but he has said very little in elucidation of a subject that has also engaged attention here, namely, the question of isolated forts *versus* isolated ships. In most of our colonies, the forts erected are intended to protect the harbour and mercantile shipping from hostile vessels, which may have escaped our own cruizers, because we, as Englishmen, generally believe when once there is war, no large squadrons will hold the seas, as our own Navy will settle with them. But there may be cases where isolated vessels may escape our ships and attack our colonies, and it is, consequently, simply for the protection of the harbours and of the shipping against such attacks that the forts have generally been planned. Still, at the same time, any soldier who has visited any of those colonies, will most

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NOTE.—[1] The Wasp Tower was 130 feet above the sea, and much as it made itself felt, the allies, at the beginning of the war, hardly knew the form of its structure: it was a square tower, 27 feet high, with a diameter of 50 feet, and surrounded by a ditch, mounting 8 guns, 5 of which ONLY could be brought to bear upon the shipping beneath. The Russians say they could only work one gun efficiently, and with that one the mischief was done. "Albion," 600 yards from the Wasp, aided by "Sampson," "Tribune," and "Terrible." "Arethusa" near sank by Cliff batteries. "Albion" set on fire and had to haul out; also "London" in hauling out "Firebrand," had towing lashings shot away. "Albion" had 10 killed and 71 wounded. Altogether the attack of the inshore squadron on the Telegraph, Cliff, and Wasp batteries was a total failure, showing how cautious Officers commanding wooden vessels should be in attacking earthworks, without allies ashore.—Page 404, Vol. iii, "Kinglake's Invasion of the Crimea."

fully agree with Colonel Childers that all our forts ought to be supplemented by a floating battery—an ironclad—which would always be able to take up such a position that no part of the harbour could escape fire, because even the most elaborate scheme of land batteries may allow a certain portion of dead ground. This would be obviated by supplementing the fire of our land defences by that of a vessel of the description pointed out. Therefore, I perfectly agree with much that has been said as to the propriety of seeking the advice of our naval colleagues when planning the construction of works for the purpose of defending colonial harbours.

Captain McEvoy: I very much regret to say that I was unable to be present when the paper was read, which I have no doubt was extremely interesting. I regret it very much, because I myself saw many of the operations connected with the American War. I was attached to the Bureau of Ordnance and Hydrography, under its chief, Captain John M. Brooke, and was stationed at Richmond during the last two years and a half of the war, where I had the personal superintendence of nearly all the experiments made with the projectiles and ammunition for the Navy, manufactured at the Naval Ordnance Works at that place. Had I been present when the paper was read, I might have been able to supplement it by some explanations which, perhaps, would have added to the interest of those present.

Admiral Hamilton, in reply, said: I do not think I have much to answer. Captain Colomb, being an old friend, has let me off very easily. In reply to Sir Leopold M'Clintock, I do not think we gain much information of any value with regard to torpedoes from the American War, for the simple reason that the Southerners had very few mechanical resources. Their torpedoes, on the whole, were rather a failure. I can only trace that five vessels were blown up by them. The Northerners scarcely used them, but torpedoes have so completely altered their character since then that I do not think we can gain any knowledge from the information derived from those operations. With regard to the earthworks, that is one of the things on which I am rather puzzled to know what history is, for, since I wrote my paper, I have come across "Pollard's History of the First Year of the War." (A Confederate account.) Admiral Porter says, in his report, that he destroyed Forts Jackson and Philip, whereas Pollard gives a telegram from General Duncan, who commanded the forts, in which he, on the 23rd April, spoke most favourably as to the condition of the forts. Although the bombardment had continued a week, and 25,000 shells were thrown by the enemy, only three guns were dismounted, five men killed, and ten wounded. The same night the forts were passed. Admiral Porter also reports, on Grand Gulf, that the earthworks were knocked to pieces, and the muzzles of the guns choked up by sand thrown into them by the shells, and that, as a rule, the water earthworks were destroyed, while the higher ones were not much damaged. The great conclusion, however, that all the accounts come to is that, though the ships could always silence the forts, they could not destroy them; that, the moment the ships passed them, the forts very often opened fire again. Mr. Scott Russell speaks as to the value of very large shells, and I must say I was not, until I had read the books, aware of the value of shells. The great reason of the success of American gunboats up the rivers against the batteries was, that these little bits of vessels were armed with nine and eleven inch guns, and, although the battery could bring three or four guns to bear against them, it could do nothing to check the damage done by the bursting of the eleven-inch shells. There can be no doubt that the Federals showed great skill in the use of their shells. Admiral Selwyn spoke of the want of trained gunners on the Federal side. I think, however, that remark attaches to both sides. Of course, the sudden increase of men from 7,000 to 50,000 necessitated that a great part should be untrained men, and, of course, we can train our men to work the guns much more quickly on board the ships than can be done on shore, because they have no military duties to perform. Therefore, we have a great advantage in that respect. Most of the actions certainly were fought in smooth water. There was, however, one case in which a fort was bombarded from the sea, and I should imagine there was a swell on, because the "Cumberland" was towed out to sea at night, on account of threatening weather. All the other actions were fought in perfectly smooth water. At Mobile, it is specially said by the Confederate report that the men were well trained artillerymen. They had been in those forts two or three years, and were, no doubt, thoroughly up to their work.

However, the smoke obscured the fleet. That obscurity caused by smoke will, I think, to a great extent stop the effect of the electric torpedo. Of course, the torpedo is to be respected, but I do not think it is as formidable as artillery fire, and I believe means will be found of neutralizing the great damage likely to occur from the use of such weapons. Admiral Selwyn said they could not lodge a shell in the Moncrieff gun-pit. No doubt that is the case, but what would be the effect on the men working that gun if shell after shell were bursting in front of them. We have heard that the men on the "Tennessee," where the shell did not penetrate, and where the port shutters were down, were blinded by the blaze of bursting shells. What would be the effect on men in a pit, of shells bursting over them? I am perfectly sure that it would be very demoralizing, and the service rendered by the guns they were working would not be of much value. The Wasp Battery was at an elevation of 700 or 800 feet, and the ships could not elevate their shot to reach it. The ships were firing shot instead of shell, and the enemy had got the range. The ships were not kept in perpetual motion, but were stationary, at 1,400 yards. I quite agree with what has been said by General Cavanagh as to the advisabllity of a naval Officer being consulted with reference to the erection of forts to protect harbours. If engineers only are concerned they may build forts which will not be an adequate protection, whereas, if a naval Officer is consulted, the probability will be that there will be no dead spot left which cannot be reached by the guns. I do not think that I have anything further to say, except to thank you for the attention with which you have listened to me.

The CHAIRMAN: There only remains for me the agreeable duty, which I am quite sure the meeting will support me in, of thanking Admiral Hamilton for his very interesting lecture, and also those gentlemen who have taken part in the discussion. It is a very large subject, and one that certainly cannot be fully dealt with in one sitting of this description.

LECTURE.

Friday, May 17th, 1878.

ADMIRAL A. P. RYDER in the Chair.

ON A COLONIAL NAVAL VOLUNTEER FORCE.

By THOMAS BRASSEY, Esq., M.P., Lieutenant Commanding Royal Naval Artillery Volunteers.

IT is not suprising that the idea of organizing a Colonial Naval Reserve should have been deferred to the present time. The growth of our Colonial Empire has been so rapid that the resources out of which such a force could be created have only lately been at our disposal.

It has been remarked by Mr. Wilson, in his recent volume on the resources of modern countries, that none of the colonies were of great promise before 1845. Canada languished; New South Wales—then including Victoria and Queensland—was a feeble settlement, still troubled by a residuum of transported criminals; the Cape of Good Hope was almost Dutch. The total English population of the whole of our foreign possessions did not, in 1850, exceed 2,000,000. The population of these colonies has at least quadrupled in thirty years, and in some cases is now tenfold what it was in 1845.

Visitors to the Exhibition now being held in Paris will see abundant and gratifying proofs of the marvellous development of our colonies, and of their ability to provide adequate means of self-defence. The Australian governments have wisely embraced the opportunity of showing to the world their varied and valuable products. From New South Wales we have copper, silver, lead, marble, tin, slate, and opals; wine—including all the varieties of the French and German vineyards—tobacco, and, perhaps most important of all, wool. From Western Australia we find leather, timber, silk, coal, lead, and wines. Victoria, which boasts of 800 trees and flowering shrubs, exhibits also coal, wines, and cloth manufactures. She reminds us, by means of pyramidal models, of the value of her productions of gold, and of the exceptional good fortune of certain adventurers. From the Cross Reef Mine £1,000,000 worth, from the Long Tunnel 221,262 ounces, from the Port Philip Company's workings to the value of £1,500,000 have been extracted.

Queensland exhibits malachite, gold, copper, cinnabar, chrome, iron, plumbago, and antimony, sugar, coffee, wheat, maize, tobacco, silk, and wool. The commercial and agricultural development of the colony is set forth in the following figures:—

In 1876 the total value of the exports amounted to £3,875,000, including—

Wool	£1,449,576
Hides	79,612
Cattle	157,772
Preserved meat ..	94,642

The value of the imports in the same year was £3,126,000.

Queensland has a population of 200,000.

The live stock depastured includes—

Horses	130,289
Cattle	1,985,807
Sheep	7,241,810
Pigs	53,455

Lastly, South Australia exhibits copper, tin, wines, timber, leather, wool, and tobacco. With such a collection before us, we are justified in forming the brightest hopes for the future prosperity of the great Anglo-Saxon communities in the Antipodes. The page of their history is short, but they are a vigorous and energetic people, eager to embrace every opportunity afforded by a bountiful nature, and labouring valiantly in the spirit of their well-chosen motto, "Advance "Australia."

The time seems now to have arrived when the colonies should be reminded of their obligations to provide for their own self-defence, and of their duty to take a part in those naval and military preparations, the cost of which should be borne in due proportions by the whole Empire.

The necessity for the organization of a Naval Reserve for the defence of the colonies has been recognised by many lecturers, who have preceded me in the theatre of the Royal United Service Institution. The brothers Colomb have been among the foremost in urging the need of such a force. They have shown what are the strategical points which are of the most vital importance to the integrity of the British Empire, and have earnestly recommended the appointment of a Royal Commission to examine the subject. Nothing, however, has been done, and we find ourselves at the present moment contemplating the possibility of war, and utterly unprepared with the means of defending the important outlying members of the Empire by those local forces, which might so easily have been organized. Readers of the papers published in the "Nineteenth Century" will remember the imaginary but very forcible description recently given by Sir Garnet Wolseley of a Russian squadron performing a cruise of circumnavigation in time of war, arriving off all our most valuable settlements, and winning a series of inglorious triumphs by levying black-mail on rich seaports, which could offer no resistance. It would per-

haps be found more difficult to carry out such a series of operations, than to describe them with the ready pen, which Sir Garnet so well knows how to use; but the bare conception of such a state of things ought to be unendurable, alike to the people of the mother-country and of her dependencies.

The policy of encouraging such a movement having been accepted, there can be no practical difficulty in raising a Naval Reserve in the colonies. If it be intended to provide the means of manning sea-going ships, the Naval Reserve which has been formed for the defence of the mother-country presents a model for imitation. If coast and harbour defence alone is attempted, the system of organization adopted for the Royal Naval Artillery Volunteers may be followed with advantage.

In considering a project for a Colonial Naval Reserve, it is essential to determine, *in limine*, to what extent the direct intervention of the Imperial Government will be required. Among a certain school of politicians, it will be considered that local defence is a task which must be left entirely to the Colonial Governments. They think that the colonies are quite able to take care of themselves; that, man for man, the colonists are better off than the population of the mother-country; that it is the duty of our statesmen to rear up young and vigorous communities in habits of self-defence, and to bring home to their people a sense of their obligation to make sacrifices for public objects, and to bear their proportionate share with the mother-country of the burdens of military preparations.

Another school of politicians is in favour of a closer connection with the colonies. They are anxious to promote a federal union of all the members of the British Empire. They wish to arrive at a mutual agreement on all questions of tariffs; and, with a view to concerted action in Imperial questions, they are in favour of giving to the colonies representatives who should sit in the great council of the Empire at its seat of Government. In consideration of the protection afforded by the fleet, they are prepared to recommend a contribution from the colonies to the naval expenditure of the country. In these views I concur, and I see additional evidences of their truth in the most recent incidents in our political experience. It is rarely possible for this country, under a popular representative Government, to pursue a satisfactory course in its relations with foreign countries. The greater number of those who take a lively interest in public business concern themselves rather with domestic questions than with foreign policy. Being without knowledge, they arrive at hasty conclusions, and every new incident that occurs produces a corresponding change in their opinions. Hence it is that our foreign policy is inconsistent and uncertain; that we disappoint allies in whom we have raised expectations; and make sacrifices for unattainable or unworthy objects.

The Eastern Question once disposed of, it is my earnest hope that the attention of British statesmen may be directed rather to the object of drawing the colonies and the mother-country more closely together, than to continental affairs.

In our relations with other nationalities we excite jealousy by

our prosperity. Although singularly unselfish and unaggressive, our country is not greatly loved abroad. On the other hand, old England, as their mother-country, still retains the warm affection of her colonies. Our Government may show a chilly indifference to their concerns, but England is still the "home" of all English-speaking people; and the identity of religion, history, laws, and literature, unites together every member of the family by bonds more enduring than the protocols and treaties, however valuable they may be, which are negotiated with foreign nations.

The arguments in favour of a cordial co-operation of the United Kingdom with the colonies in measures of mutual self-defence have been conclusively stated by several able writers in recent periodicals. I may specially refer to Captain Colomb, Sir Julius Vogel, and the author of a paper on England and her Colonies, which appeared in "Fraser's Magazine," in January. We are reminded, in the papers to which I refer, of the value of the colonies to the mother-country, for the inevitable development of the British population, and as the main source of our maritime prosperity. While foreign countries are steadily determined to exclude British industries from the markets over which they exercise control, the value of the colonial trade becomes increasingly manifest: and, while we derive these advantages from our vast colonial connection, it is obvious that, in proportion to their own prosperity, the colonies are bound to take their share in defending the Empire. It is to be regretted that these obligations were not more strictly defined at the time when the privilege of self-government was conceded.

In his speech at the Crystal Palace, in 1872, Lord Beaconsfield said:—"Self-government, when it was conceded, ought, in my opinion, "to have been conceded as part of a great policy of Imperial consolida- "tion. It ought to have been accompanied by a military code, which "should have previously defined the means and responsibilities by "which the colonies should have been defended, and by which, if "necessary, this country should call for aid from the colonies them- "selves. In my opinion, no minister in this country will do his duty, "who neglects an opportunity of resuscitating as much as possible our "Colonial Empire, and of responding to those distant sympathies "which may become the source of incalculable strength and happiness "to this land."

From an Imperial point of view, the best defence of the colonies consists in a powerful navy; and it is because the naval service is constituted in part for the defence of the colonies that we may reasonably claim from all our dependencies contributions in equitable proportions, to be mutually and amicably determined, towards the naval expenditure of the country.

The latest tables, showing the progress of British mercantile shipping, give the total tonnage of the mercantile navy of the British Empire at 8,133,837 tons, and the tonnage of the United Kingdom only at 6,336,360 tons. The difference between these amounts (1,800,000 tons) represents a total tonnage for the colonies which is little short of the combined tonnage of the French and German

Empires. It must be evident that the owners of such a large tonnage will be quite able to contribute their share of the cost of defending the harbours from which they trade.

It has been suggested by Captain Colomb, R.M.A., that one of the home dockyards—Pembroke, for example—might be closed, and the staff transferred to a dockyard which should be established at Sydney or Melbourne. Captain Colomb urges that, with our remaining dockyards, and the boundless resources of our private trade, we should be abundantly able to provide for the construction of new ships, and for the repairs of the Navy, even in times of the most pressing emergency; while, on the other hand, the growing importance of the Russian navy in the Pacific, the extension of British trade over most of the islands in that vast ocean, and the great distance which separates our Australian territories from the mother-country, make it highly desirable to establish a dockyard in that part of the world. It is to be presumed that some contribution would be obtained from the local governments towards the expenses of such a dockyard, if established in their midst. The facilities which it would afford to the mercantile marine would present an additional inducement to the colonies to make a contribution towards its maintenance.

The colonial governments have already begun to consider the question of local defence, and in one or two instances they have provided low free-board ironclad turret-ships for that purpose. Victoria has lately voted a sum of £350,000, together with an annual outlay of £73,000, to provide ships, artillery, torpedoes, and rifles, for the local defence. New South Wales has voted a like sum for the same object. The colony has formed a Volunteer Naval Brigade of 250 men, the annual expenditure on this little force being £3,916. In the Canadian Dominion, a committee appointed by the Royal Halifax Yacht Club, in a report dated 14th April, 1873, strongly recommend the organization of a Naval Reserve, a Coast Guard to protect property in the event of shipwreck, and a Lifeboat Institution.

It may be assumed that the Colonial Governments would be fully prepared to bear their share of the expenditure required for any complete scheme of Imperial defence by naval means; we may pass on therefore to consider what kind of force would be most useful for colonial service.

It has been already observed that the most effective means of defending the larger ports would consist in ironclads or turret vessels rather than in forts. Captain Colomb, R.N., has urged in his Prize Essay that the main object of our naval organization consists in the maintenance of our communications by sea, and that our coaling-stations abroad are the principal strategical positions which it is essential to guard. He argues that this object will be best attained by the maintenance of an adequate sea-going fleet, charged with two great defensive functions:—(1) that of keeping the enemy in his own ports, (2) that of keeping open the great sea-routes to and from the heart of the Empire. He considers that this duty can only be performed by sea-going vessels, and that the building of powerful ships, which are not fully sea-going, and which are more or less incapable of

maintaining the ocean communications of the Empire can only be justified on the assumption that the chief danger to be apprehended lies in a successful attack on our harbours.

But if, he says, our enemies are to career at will across our lines of communication, while we guard their terminations at head-quarters, what will be left us to guard? He puts much faith in the sea-going fleet resting on the naval station as a protective force, and condemns with steady design the idea of the harbour-defence ship. Such vessels are every whit as likely to be withdrawn as the sea-going ship, when they are wanted; and the only result is that you build a bad sea-going ship, when, had you never considered harbour-defence, you would have built a good one.

Captain Colomb throws the local home and colonial harbour-defence entirely on forts, and the stationary and locomotive torpedoes. The supplemental local harbour-defence corps is to consist of volunteer torpedo men, whose functions will be of a nature peculiarly adapted to the superior education and undoubted skill and daring of the men who would be enrolled in such bodies.

This view is confirmed by the recent report of Admiral Phillimore on the conduct and efficiency of the Royal Naval Artillery Volunteers, dated 15th March, 1878.

> The opinion of my predecessor on the Royal Naval Artillery Volunteers is given at page 7 of his Confidential Report, on quitting office, dated 18th October, 1876:—
>
> "That they would be useful in the event of war, in the defence of the estuaries, while in peace they serve as a connecting link between the Volunteer movement and the Royal Navy."
>
> Both at London and Liverpool the condition of the Brigade is excellent. The Volunteers drill with celerity and precision, and are extremely zealous. They cheerfully conform to discipline, and are desirous of improving themselves in every way when embarked for their annual drill.
>
> In some places they might supply the place of the Coastguard temporarily, if that force should be suddenly embarked.
>
> They might furnish guards at rendezvous and places of embarkation to preserve order. Many of them have become expert artillerists.
>
> I think the movement assists in making the Naval Service better appreciated and understood at certain places, and consequently increases the popularity of the Navy generally, which, if more seamen were required for ships of war, might be of great value in facilitating fresh entries.

In my judgment, Captain Colomb is the advocate of a wise policy. The Imperial and Colonial Governments should combine to create a fleet of sea-going ships, which should be kept in reserve in the harbours on the Australian station. Torpedoes and torpedo-boats should be provided for harbour defence. The Colonial Governments should man the sea-going ships, stationed in their own harbours, with their Naval Reserves, and they should provide the *personnel* necessary for harbour defence by the organization of corps of Naval Artillery Volunteers, after the model of those which have been successfully established in London and Liverpool.

The number of sea-going ships and torpedo-boats, and the forces of Naval Reserves and Naval Artillery Volunteers, which would be necessary to man them, is a subject worthy of mature examination by

a Royal Commission. Such a Commission should include, not only officers of acknowledged capability to deal with technical questions, but representatives, who should be authorised to express the views of the colonists, with reference to the proportions in which they would be prepared to contribute to the expense.

I wish to insist emphatically on the importance of the work which would devolve on such a Commission. We cannot conceal from the world the wealth accumulated in the colonial capitals, all of which lie on the sea-board. Their inhabitants possess all the spirit and resources necessary to repel an attack, but these places are at present defenceless. Floating and stationary defences cannot be designed, a Naval Reserve or Militia cannot be organized, without naval and military advice. The colonies having no body of officers to assist them in such a task, it is for the mother-country to take the initiative in the discharge of the urgent Imperial duty of preparing a scheme for the mutual self-defence of all the dependencies of the Empire.

I am not competent to enter into the details of such a scheme as the Royal Commission which I recommend would be enabled to prepare. A degree of local and professional knowledge, which I cannot pretend to possess, and which, indeed, cannot be combined in any individual, would be required in the preparation of a satisfactory plan. As an example of what might be done, I will, however, venture to refer to some notes which I made on the formation of a Naval Reserve in Canada, after visiting the ports in the Gulf of St. Lawrence in 1872.

It is believed that in the Canadian Dominion there are not less than 87,000 seafaring men. In 1872, about 1,000 decked vessels, and 17,000 open boats, manned by 42,000 men, were employed. On December 31st, 1876, the Canadian Dominion possessed 6,952 vessels, of 1,205,565 tons. During the year 1876, 480 new vessels, of 151,012 tons, were built in the Dominion. The value of the fish exported from Canada in the same year amounted to £1,000,000. The value of the exports of the same class from Newfoundland in 1875 was £1,340,000.

It is stated in the annual report of Governor Hill, for 1872, that about 10,000 men are engaged in the seal fishery of Newfoundland, and that this number includes almost every available able-bodied man on the island. The total male population, it should be added, is 75,000.

The rigorous climate of Canada and Newfoundland, throughout their long winter season, makes it impossible for fishermen to follow their regular vocation. The long interval of enforced idleness during winter would afford an admirable opportunity for regular attendance at drill, without interfering with other lucrative employment. A vigorous effort should be made to enrol these colonial fishermen in the Naval Reserve of the British Empire. They are thoroughly inured to the hardships of the sea by the severe weather, which frequently prevails on their native shore. No subjects of the British Crown are more loyal and devoted. There would be no difficulty in giving to the fishermen of Newfoundland and the maritime provinces of the Canadian Dominion an opportunity of embarking for their annual drill at a port

easily accessible from their own homes. A vessel should be commissioned specially for the purpose of training seamen, who have joined the Naval Reserve from Newfoundland, from the ports in the Gulf of St. Lawrence, and from Quebec, Montreal, and other places on the great river. The vessel should be of the corvette class, having a covered deck, in which the battery of guns would be placed. In such a vessel the drills might be carried on with regularity in the most severe weather. The drill-ship would be stationed during mid-winter at St. John's. The harbour is admirably sheltered and a large population of fishermen is congregated in the town and its vicinity. During a portion of the winter the drill-ship should be moved to other points on the coast where the fishermen are settled in large numbers. Thus the members of the Colonial Naval Reserve would have an opportunity of going through the annual course of drill, without being exposed to the hardship of a long sea-voyage to St. John's in their small fishing boats in mid-winter. Along the coasts of Newfoundland there are numerous admirably sheltered harbours, which are rarely frozen up. An anchorage might be selected for the training-ship both in Placentia Bay and in Trinity Bay, perfectly secure, and easily accessible to the large numbers of British seafaring men dispersed along those distant shores. As the spring approached, and the navigation was opened in the Gulf of St. Lawrence, the ship could proceed from harbour to harbour along the southern shores of the Gulf. At Sydney, Charlottetown, and Gaspe, many seamen could be enrolled for the national reserve. It should be arranged that the drill-ship should visit the harbours mentioned sufficiently early in the season to enable the seamen sailing from those ports to go through their annual drills, before the navigation of the St. Lawrence was fully open. The reserve men might thus have the opportunity of attending on board the training-ship, without suffering the serious inconvenience which would be felt if they were taken from their employment afloat in the season of open navigation. Another similar training-ship should be stationed at Halifax, which should visit the numerous harbours on the coast of Nova Scotia and in the Bay of Fundy, in the winter season, when multitudes of fishermen are compelled to remain on shore in consequence of the inclemency of the weather.

We have not neglected to avail ourselves of the services of our colonial population for the purpose of increasing our military resources. We have enrolled large bodies of men belonging to races distinct from our own. There can be no sufficient reason for neglecting to recruit for the Navy among the vast numbers of loyal Englishmen, who animated by a splendid spirit of enterprise and adventure, have settled on the extensive coasts of our Canadian Dominion.

In a lecture delivered at the Royal Colonial Institute, on the 4th February, 1873, M. Bourniot, a member of the Canadian Senate, remarked that, "In the men that sail the fishing fleets of Canada, we "see the elements of a very powerful marine, which will be found in- "valuable in times of national danger. It may be estimated that the "total strength which the fisheries employ throughout all British North "America is composed of some 70,000 men." M. Bourniot was of

opinion that there was no reason why training ships, supported by the local governments, should not be started in the colonies, if the system were found to work well in the United Kingdom.

The policy recommended seems to be in consonance with the views expressed by Lord Elgin, who, when Governor-General of Canada, argued with so much force on the advantages to England and her colonies of an intimate union between them. "Is the Queen of "England," he wrote, "to be the Sovereign of an Empire, growing, "expanding, strengthening itself from age to age, striking its roots "into fresh earth, and drawing new supplies of vitality from virgin "soils? Or is she to be, for all essential purposes of might and power, "Monarch of Great Britain and Ireland merely?"

The organization of a Naval Reserve in our North American Colonies is not only to be desired as a means of adding to our naval strength for Imperial purposes, but also for defending the colonies themselves. All our colonies, including India, should have a defensive force of their own. Organization beforehand is essential to success in war. By the bestowal of infinite pains on her military organization, Prussia, which seemed for ever fallen after the battle of Jena, turned the tide of fortune in 1815, and, after the campaigns of 1866 and 1870, has become the greatest power of Central Europe.

It is one of the great recommendations of the scheme which I have advocated on this occasion, that it need not involve the country in a lavish expenditure. It is well to prepare in advance plans of earthworks, to be thrown up when required, and to organize corps of naval volunteers. It does not follow that we should undertake the construction of the extravagant fortresses which surround our arsenals at home, or withdraw a single man from the well-rewarded labour-market of the colonies. To build fleets and forts, and to maintain armies in every dependency of the Crown, would be an exhausting and an unnecessary effort. I remember, and approve, the language held by Sir Robert Peel in 1850, when he said: "I believe that in time of peace we must by our re-"trenchment consent to incur some risk. I venture to say that if you "choose to have all the garrisons of all your colonial possessions in a "complete state, and to have all your fortifications secure from attack, "no amount of annual expenditure will be sufficient to accomplish your "object."

Since the date of Sir Robert Peel's speech, that noble Volunteer movement, one of the most honourable features in the recent history of this country, has been originated. A quarter of a century ago, the voluntary submission to drill and discipline of large masses of men, in numbers for exceeding those enrolled in the regular Army, was not anticipated by British statesmen. By the extension of the Volunteer movement, garrisons can be maintained in the largest fortresses and in the most distant outposts, without adding in any appreciable degree to the charges on the Imperial and Colonial revenues.

The mother-country could readily furnish a staff of officers and instructors for the purpose of training the Colonial Naval Reserves. The number of officers required must depend on the strength of the

force which it is deemed expedient to raise. In whatever numbers they may be wanted, they can be supplied from the ranks of those who have retired from the active list, or who are, for the time being, on half-pay. The presence of a body of naval Officers in our colonies will form a valuable link with the United Kingdom.

They will carry with them the spirit of discipline and devotion to their country, which they have acquired from service in the Navy, and they will help to keep alive its illustrious traditions in those young communities, in which it is so important to create a high tone of morality and conduct. The example of her great men is the most valuable inheritance of a nation, and in the career of many of our sea officers the highest moral excellence has been combined with dauntless bravery and skilful seamanship.

Readers of naval story will be familiar with the fine passages in which Southey concludes his biography of Lord Nelson. He tells us how, on the sunny morning of the 21st October, 1805, as the British fleet was bearing down on the formidable array of ships under Villeneuve, Nelson withdrew to his cabin, and, looking for death with almost as sure an expectation as for victory, piously discharged his devotional duties. You know with what calm courage shortly afterwards he entered into battle, and with what conduct and valour our officers and men followed their illustrious chief to victory. The battle of Trafalgar, though considered by Southey as the most signal success that ever was achieved upon the seas, was dearly bought by the death of Nelson; and yet, as his biographer most truly says, "He cannot be "said to have fallen prematurely, whose work was done; nor ought he "to be lamented, who died so full of honours, and at the height of "human fame. The most triumphant death is that of the martyr; the "most awful that of the martyred patriot: the most splendid that of "the hero in the hour of victory: and if the chariot and the horses of "fire had been vouchsafed for Nelson's translation, he could scarcely "have departed in a brighter blaze of glory. He has left us, not indeed "his mantle of inspiration, but a name and an example, which are at "this moment inspiring thousands of the youth of England, a name "which is our pride, and an example which will continue to be our "shield and our strength."

That the navy of our own time contains many brave men, prepared to serve their Queen and country in the spirit which animated Lord Nelson, we cannot doubt. You remember how the gallant Burgoyne refused to enter the boat in which the sole survivors of the crew of the "Captain" were saved. Humanity to the savage, and fortitude in death were conspicuously illustrated in the closing hours of Captain Goodenough. But the occasions which brought out the high qualities of Lord Nelson are happily rare. The annals of a nation must be long, in order to furnish many examples equally illustrious. Our share in the honour which belongs to the descendants of such men is a privilege of high value; and it will surely be one of the strongest inducements to the formation of a Colonial Naval Reserve, that a link will thus be created with a navy possessing the splendid traditions which belong to the British service.

Captain CYPRIAN BRIDGE, R.N.: Lest it should be supposed that I have risen too soon, and not waited for other Officers of greater experience, and who have given more attention to this subject than myself, I will, with your permission, just mention in a few words why I take such an interest in this question. In the first place, I take an interest that I believe every naval Officer must take; in the second place, I take an interest that I think every colonist (I myself having been born and lived in a colony for some years) ought to take in it; and, in the next place, I take special interest in it as having taken some part in trying to direct the attention of my brother Officers and the public at large to the great question of raising a volunteer force which might be to the Navy what the great Rifle and Artillery Volunteer force has been to the Army. For these three reasons I have, perhaps, been induced to pay more attention to this subject than many people are inclined to think it deserves. In my opinion, no subject that could be brought before any assembly of Englishmen, whether in the mother country or the colonies, is more worthy of attention than this. As Mr. Brassey has very well told us, in the able and interesting paper which he has just finished, the very life of the Empire depends upon those relations which have been maintained with many of our great colonial dependencies. It has been my good fortune to visit every great group of colonies, with the exception of those in South Africa, beginning at Vancouver's Island and ending in Australia, so that I have a somewhat intimate personal knowledge of the condition of many of them. Of the great colony of Canada I am only acquainted with the maritime provinces; of Canada proper, the only places I have ever visited are Gaspè and Paspebiac; as to Nova Scotia, Newfoundland, and New Brunswick, almost every part of their coasts I know well. To show how feasible it has been thought in the Dominion of Canada, even some years before the Confederation, to establish a naval force of their own, there was in existence at Halifax, certainly as far back as 1865, a naval volunteer force. When I became aware that it was in existence, my stay at Halifax was too short, and my occupations too numerous, to enable me to make many inquiries concerning it. I did see some of the Officers and men in uniform, but I understood it was more upon a land basis than a sea basis. The Officers had military titles, and it was intended that they should be employed in time of war chiefly in defending batteries on shore. This is not, of course, what has been aimed at in the proposals Mr. Brassey has made this afternoon; but still I think it does show that, even at that period, they were willing to take some steps towards forming such a force as has been proposed. With regard to the docking facilities in Australia, there must be many Officers who have served in Australia, much later than I have; but as far back as 1859, the ship to which I belonged, of over 1,400 or 1,500 tons, as we then counted them, was docked at a very large dock at Cockatoo Island, above Sydney, which even at that time was very much larger than was necessary to take in a ship of her size, and had previously taken in an Austrian frigate. The island was entirely given up to workshops and such places as are required in a naval yard; and I should imagine, with a very small expenditure of money, and in a very short time, it would have been made, and probably is now made, a very suitable and useful naval arsenal. I should, therefore, be very sorry to see the proposal carried out which Captain Colomb has made, and Mr. Brassey approved, to close one of our dockyards to open up others, because I do not think it is necessary. There was one point to which Mr. Brassey did not allude, which he mentioned as supplementing his proposal, and that is, he did not draw our attention—it could not have escaped his notice, because he has recently been to those parts himself—but he did not consider it necessary to draw attention to the fact, that in the Indian Empire we have a very large nautical population. I do not mean to put them upon anything like the same footing as the colonists; but that they are good seamen, and fit to go anywhere, has been shown by the manner in which they have altogether taken the place of European seamen on the splendid Peninsular and Oriental steamers, not to mention others. It would be possible to so organize a force of these men, that they might set free a very large number of she seamen belonging to Her Majesty's Service at present engaged in special employment, which, during war, could be performed by men of the description of which I have spoken, and would enable the Europeans who now are employed in them to take part in the more important operations of war. There are also, I believe, con-

siderable naval establishments there; at Bombay, I understand, the dockyard is a very large one. Mentioning that, reminds me of the unfortunate fact, that the Indian Navy was abolished; we are now feeling the want of it. In Mr. Brassey's paper, he of course alluded to a subject which, if not obviously, is very intimately connected with one to which he was virtually addressing himself, and that is the defence of our ocean commerce. Of course, this question of raising a volunteer naval force in the colonies is solely with a view to defending our commerce. It seems to me there is a great amount of unnecessary alarm. No country has ever had so great an ocean commerce as we have, and no country has ever been in a position so thoroughly well able to defend it. All the arguments drawn from the case of the "Alabama," or the history of the war between the Northern and Southern States, when the American flag was driven from the ocean by one or two fast cruizers, are absolutely inapplicable to the condition of affairs at present. The American flag flew on sailing ships almost exclusively, and the cruizers which went against those ships, and eventually swept them off the seas, were steamers. A glance at the chart (on the wall) will show that it is marked with numerous lines, which lines, going from port to port, mark out the great highways upon which the ocean commerce of the world chiefly passes. Almost without an exception, every one of the most important of those lines begins and ends at or passes through some British possession. There is one great gap, I admit, in the system of defence supplied by our foreign possessions; that is the line which, we will say, begins at Vancouver's Island and ends at the south of South America and the Straits of Magellan. It is true that that line is flanked entirely by foreign countries, and we have no stations within those limits, which must be some 6,000 or 7,000 miles apart, where we can post a defensive squadron, or, what is still more important, for a defensive squadron, obtain supplies. But we ought to recollect we hold both ends of the line in our own hands. We hold Vancouver's Island, and we hold almost entire command of the Straits of Magellan in the Falkland Islands. If, therefore, we maintain the positions we have got, and by so doing prevent the only cruizers that can be sent abroad by any enemy, Russia for instance, obtaining supplies of coal, I do not see what we have to fear from vessels employed as the "Alabama" was employed. Our commerce at present is carried on to a much greater extent than ever before by steam vessels. Those steam vessels would find almost along the whole of their route always friendly coaling stations where they could obtain supplies of fuel. But no other country would be in the same position, or scarcely any other country. Consequently, I do not think there is much danger, except perhaps at the very outset of war, when cruizers would start with full supplies on board, which they would afterwards find very great difficulty in replenishing. I do not think, except at the outset of war, much danger need be anticipated; and probably the increased "risk," in case of war with Russia at this moment, would be no more than a very small addition to the insurance already paid. It therefore shows how extremely necessary it is that we should defend and hold these places, and keep them entirely secure against attack. Therefore I say it would be more advisable to turn our attention to establishing a naval volunteer force which should be upon the spot, and should keep those places in our hands, and prevent them falling into the hands of the enemy, than to drawing upon it to man cruizers and keep open highways, a service which I think would be thoroughly well performed by the Royal Navy. In common with many others, I have read the very able paper in the *Nineteenth Century*, written by Sir Garnet Wolseley, and I am one of the few people who do not agree with it in the least. I think an examination of it—it has been submitted apparently to no examination in any other periodical—would show that the career of that Russian squadron which Sir Garnet Wolseley has painted, has had no parallel in literature, except perhaps the cruize of the "Flying Dutchman." My impression is, if they were to pick up some of these small vessels, of the "Frolic" class, for instance, which he thinks likely, we should be very much the gainers by the fact, and that they would be terribly hampered by such a capture in their possession.

Captain FIELD, R.N.: I did not come here with any intention of speaking, and I did not hear the opening remarks of the lecturer, but as the Chairman has invited me to address the meeting, I will take the liberty of saying a few words. And, first, I desire to say how gratified I am to see the honourable gentleman come here as he

does frequently, to offer criticisms and remarks and suggest improvements in our system of naval defence, and I only wish there were more honourable members in the House of Commons who would take the same interest in naval affairs. It is for want of more men to interest themselves in naval questions that the Naval Service is not adequately represented nor naval policy adequately discussed in that House. But when I turn to the lecture the honourable gentleman has delivered, I have to ask myself what practical good is likely to follow from it. He makes certain very valuable suggestions, but then arises a question, how are they to be carried out? No doubt, as he states, Officers can readily be supplied by the mother country to our various colonies who might assist in any scheme of local defence in those colonies; but, I take it, the mother country cannot be expected to organize a system of colonial defence in colonial waters. Whatever defence we may set on foot would be mainly an Imperial defence, and then our best mode of defending our colonies is on the high seas, meeting hostile fleets or cruizers. But if the honourable gentleman's views are to be entertained at all, they must be entertained by the Colonial Governments, and it would become our Government's duty to invite their co-operation and support; therefore, I should say papers like that which has been read to-day had better be sent forthwith to each Colonial Government, that they may study the question from our point of view. But the honourable gentleman suggests that ships might very well be supplied. He did not quite say how they were to be found, whether to be built and supplied by the Home Government or by the Colonial Governments. I rather fancy he inclined to the idea that the Home Government would supply the ships, and the Colonial Governments the men. Then arises this question—the House of Commons is very jealous of the national expenditure, and if we are to build ships to send out to the Colonies for the Colonial Governments to man, I think people in England will consider if we build the ships and pay for them, we had better man them ourselves, because then they will not be confined to the use of a particular colony, but will be ready for use in any part of the world. I, therefore, think the question of the supply of ships by our Home Government is one not likely to be entertained by the House of Commons or the country. The scheme sketched out by the lecturer seems to me to resolve itself into this, that it can only be used for defensive purposes in their respective harbours, guarding their harbours, whether by torpedo crews or the erection of forts and manning them; so that the colonial port may be safe from a *coup de main* on the part of a foreign squadron. We have at present no colonial navy. There is one ship, I think, in Australia which has been sent out and paid for, but I think it would be a very good thing to invite Colonial Governments to pay certain sums of money to meet the expenditure that will be incurred by the Home Government if they do send out more ships to colonial waters. If the Colonial Governments would be prepared to pay the expenses, the mother country would not hesitate to send more ships out there, and to send out gunners and crews, and to supplement those crews by men raised in the colonial stations, so that after all it resolves itself simply into a pure question of money. Is there public spirit enough in our various colonies to carry out the views the honourable gentleman enunciates? I think there is good public spirit in them, but it takes the near approach of war to stir them up to any exertion. It was only the near approach or fear of war that led to the formation of our great Volunteer Corps in this country, and it will only be the sense of danger which will induce our colonial friends to stir themselves up to form some such corps, whether land or sea forces. But I think they might very properly be invited by this Government to take some measures for their own defence, and not to leave the mother country to do everything for them. They have behaved admirably in Canada in forming local militia corps, and Australia is stirring itself on the question. They have invited an eminent engineer to go and make suggestions as to the best way of defending their harbours. Beyond that, I do not think the mother country can be expected to find funds to protect colonies merely in colonial waters. Whatever funds the House of Commons will vote they will insist shall be expended for Imperial defence generally, and not in sending out ships built in this country to be manned by any colonial force whatever. Those are my humble opinions. I think, whatever can be done by the colonies in the way of local defence will be done on intimation from the mother country, but they must find the money; they must also find the men, and if they will find the money for the ships we can readily supply them.

Captain P. H. Colomb, R N. : After Mr. Brassey's splendid peroration it is rather difficult to get one's mind back to the facts of the case before us, but the remarks of Captain Bridge and Captain Field have brought us into a more proper frame of mind for discussing the question. At the outset I have to make one little remark of a personal nature. My brother and I, as in the case of the twins in the popular song, get sometimes mixed, and it is difficult to say occasionally which is which. Mr. Brassey has sometimes particularized me, and when he has done so he has always most correctly stated my views, but in the case of proposing to close the dockyard at Pembroke, and to open a dockyard instead at the Antipodes he is quoting the other twin, and consequently I am not to be held responsible for that. I do not mean to say if I considered the question, I should not agree with him ; my brother and I are in very close agreement on these questions, but it is a matter which I have not at all considered, and I have no opinion about it. Wherever Mr. Brassey comes I observe that he brings with him an enormous number of those things which I always express myself as being very fond of, namely, facts. He has given us splendid facts in the paper, as in everything he has written on sea matters : the collection of facts is magnificent. His statement of the growth of the colonies, I am quite sure, puts a new face upon these questions to most of our minds ; for my own part, though I have been considering this question to a certain extent, I never thought before of the enormous growth which has taken place since 1845. It never struck me in that light, but it shows we have in that time altered our position altogether in the world, that whereas we were then a country contained in the British Islands, with some little outlying dependencies, we have now become simply the centre of a great English-speaking Empire. I was very near bringing a book with me, and I am glad I did not, because if I had I should have been tempted to have quoted from it too largely—a book which my brother has drawn up, which is a simple collection of articles from colonial newspapers on this question of Imperial defence, and it is something quite surprising to anybody who will run his eye over those articles to see how ready the colonies are to meet us if we will only go to work to meet them. They seem to say, " You have only to say the word ; let us talk it over ; admit that you will not give us " up ; admit that we are brothers ; admit that the English Empire is not the British " Islands, but is scattered all over the world, and we on our side will stand by you " shoulder to shoulder as long as you choose to call upon us." That seems to be the general tone of the colonial press, and that seems to me to answer Captain Field's question ; and I am very sure of this fact, that every friendly word uttered towards the colonies in any public assembly in England penetrates to the colonies, and is read there, and produces a corresponding friendly feeling towards the mother country, and I am quite certain that that will be the effect of Mr. Brassey's paper here to-day. I recollect reading in some of the debates—in the New South Wales House of Parliament I think, but I am not sure where—a very strong opinion was expressed in favour of trusting to the Royal Navy, and if necessary paying it, for the outer line of defence of their colonies. They seemed to say that they would wish themselves to confine their own efforts, out of the control of the Imperial Government, to the local defence, but they did not seem at all indisposed to bear charges for a force which should not be colonial, but should be used for the defence of their colony, as well as of any other, of course bearing a proportion according to the number of Her Majesty's ships which were present. I hope Mr. Brassey in his answer will make clear the question that Captain Field referred to. I did not myself gather that he meant this : that England was to build the ships, and that the colonies were to find the men. I rather gathered that he wished that a Royal Commission, drawn from England and the colonies, should meet together for the discussion of the question—amongst others—of defence ; that that would be really a detail to be decided afterwards. So soon as any colony had expressed its willingness to contribute its quota, that then the disposition of that quota, and how the money was to be spent, would be decided by a joint Royal Commission. That was what I understood. If it were to be said that an ironclad was to be built by England, and sent out to a colony, to lie there in the harbour to be only manned in time of war, I think I should be rather against that policy. I should rather say that a colony like Australia should provide a quota for the purpose of keeping up a sufficient Imperial naval force for the outward defence, and that then the local arrangements of the colonies themselves should

be entirely devoted to the defence of their harbours against blockade or sudden attacks. Mr. Brassey has very truly represented me in saying I put great faith in a colonial system of naval volunteers, who shall rest the defence of their ports mainly on the use of torpedoes. It is the cheapest mode of defence, especially the spar-torpedo—Mr. Thornycroft's model. It is cheap, and it requires for its use men of great intelligence. The class from which the volunteers would be drawn would be the people to manage such vessels: they would have the necessary resolution and daring to make the attack, and, at any rate, if they did nothing else, I believe they would keep them off by simple fear. But when they had done that, they would leave the Imperial naval force free. We should always know the ports were safe behind us, and we should take care that ships bound to those ports were unmolested on their way towards them. But I should not draw the line so closely as to torpedoes; I would extend it, I think, to the "Gamma" and "Staunch" class of gunboat, a class of ship quite capable of attacking an ironclad, but not capable of keeping the sea, and which seems to be a weapon costing a small sum, and exceedingly available for the defence of ports. I was very much struck with Mr. Brassey's statement of the number of sea-faring men available on the coast of Canada and Newfoundland, and with the facilities which are given for the drill of those men at small inconvenience to themselves on account of the long winter. I cannot help thinking if they, as a small branch of the great matter, were taken in hand, we might be able on occasion to drawn on Canada if we wanted it, for I should not be prepared to go to Australia for our seamen. I think the difficulty of the question is this: that up to quite recent years the colonies have been told by us always that, "In point of fact, we do not much care about you, for you can go if you like. You "are of no very great service to us: we can get on very well without you. If you "give us trouble, we shall say, 'Go.'" It has been the policy of the country for a certain time. That policy, I am quite certain, is reversed, and I hope will never come forward again. I am quite sure as long as the English-speaking nations spread over the face of the earth hold together, it will be impossible for anybody else to make head against us.

Colonel HENRY CLINTON: The speech which has been made by Captain Colomb is exceedingly valuable on many points, especially regarding our conciliatory treatment of the colonies at the present time. If the provinces of North America had been met with such considerate treatment at the time when they were talking of separating from us, they would probably never have separated themselves from England. Then I have to say it is a great mistake to suppose that we can do anything in war if we do not get rid of the Declaration of Paris. There has been a discussion on that subject already in this Institution, and it is therefore unnecessary for me to say anything more; but I am firmly convinced that unless the Declaration of Paris is withdrawn, we can never do anything in war. There is a very speedy method of putting an end to war by sea altogether, if the English choose to make use of it. The fact is simply this, if you will have the goodness to stop the making of large guns for other nations by our own people, if you will put a stop to making torpedoes by our own people, and then warn other nations that no ship will be allowed to leave their ports with a greater thickness of iron or guns of more than a certain size, *then* all naval war would cease, and a *sufficient* number of *ironclad ram-gunboats* would maintain the freedom of all the seas for the benefit of the commerce alike of all nations.

Captain SCOTT, R.N.: Captain Bridge has touched upon a point which is no doubt very important—that is the success of the "Alabama" during the American War. We must, however, remember in regard to the United States losing their trade, that at that time sailing ships were becoming obsolete, and their trade from being principally carried in such vessels was also going down the incline; hence, it only needed a slight push, viz., the additional war insurance, to make the Americans sell their vessels, and their trade to pass with the ships sold to neutrals. This, therefore, is not a parallel case to ours at the present time. With respect to Mr. Brassey's very able paper, I wish again to refer to a point that has been more than once brought forward in this Institution. It is not enough to get weapons *stored* in *readiness*, but you must have them put into their right place for use in order to be prepared for war. To get guns *ready* to be put on board ship when war breaks out,

is not the way to be prepared for a sudden outbreak of hostilities. We have long been training and at a considerable cost our Reserve seamen: these men are consequently always learning, but for want of *practice* are, I fear, never getting perfect. What the sailors want is, that when they go on board their own merchant vessels they should carry out what they have been taught. Each merchant vessel should, I think, be armed so as to be in herself formidable. Such a vessel, if commanded by a Reserve Captain, and manned in part by Reserve men who had been keeping up their drill, would be far more formidable than any privateer that could be hastily fitted out to attack her. It should be remembered that these merchant vessels would be handled by men second to none in skill; in fact, many of their Captains are first-rate fellows, and I need not point out to you that their ships carry a splendid weapon which is ready at all times, viz., a straight, powerful, knife-edge iron stem. No wooden vessel struck by such a weapon would have any chance of escape. Given an iron merchant vessel going at enormous speed, and with a powerful stem, and you only want to add two or three light guns—not 64 or 32-pounders which would overstrain her, but 12-pounders; and she would then obtain the character of an armed vessel, and thus give the men confidence in protecting themselves. Besides the light gun and the knife stem there is the spar torpedo, a weapon which our Reserve seamen can easily handle; and as most of our merchant steamers carry whale boats they could be at once provided with an additional means of efficient defence. Then, as to Canada, the merchant ships belonging to that country—manned by their splendid seamen—would be really a very powerful supplement to our force of regular men-of-war if proper arrangements were made in time of peace. We have now got into a habit of considering the ironclad only as a man-of-war, but these merchant vessels are, at least for all points of *defence*, equal to most of our wooden vessels in their speed, in their power of ramming, in their sustained steaming, and in their sea-keeping powers. Turning to what Mr. Brassey has said about the armament for our colonies, I think it is necessary to commence on a small scale of expenditure, and that what is most wanted is first to enrol the seafaring men that are on their coasts for coast defence; likewise to enrol all the traders and their seamen as a naval Reserve, and not to incur the expense of building special war vessels, but rather to utilise all existing means of defence. Let the men be enrolled and also the vessels and boats in which they are accustomed to go to sea, and then what more simple than to drill and afterwards to put torpedoes on board them? In addition to the torpedo armament, which I look upon as mainly serviceable for the purposes of defence, you have in your colonies an energetic seafaring people that could be easily organized for defence; and I believe it could be done at a very small cost. My own idea is, that from the instant the Reserve men are called out for drill they should be taken to practical work; let them be put to fortify those positions which are most important, and to make roads to and from them along the coast line. There are no fortifications so cheap or more efficient than sand banks and earthworks. Therefore, your shore drill should commence with erecting such defences, and your naval drill with firing torpedoes, which should be kept at all times ready for use. The colonists, as we hear on all sides, are quite ready to do their part, and I do believe that if that part were pointed out by a Royal Commission, it would have most important results. It would certainly show to other nationalities the latent force and power which this country really possesses. We have seen some newspaper articles lately which tend to give foreigners a very imperfect notion of the actual resources of this country; these affirm that our Empire is so scattered that it has an inherent source of weakness. I venture to maintain, on the contrary, that its extension is an inherent source of strength, for our colonies, settlements, and coaling stations now girdle the earth, and would enable us to keep the seas in time of war. I again affirm that all our ironclads should be sea-going, and that a coast defence ironclad is an anomaly; and I believe that this paper is likely to be of very great service, and I for one think that our hearty thanks are due to Mr. Brassey for coming forward and reading it on the present occasion.

Major-General Lowry: I beg, as a military man, to express my humble but warm appreciation of the opportune and admirable paper which has been brought with so much pains before us to-day by Mr. Brassey. I rejoice to know that he is

a Member of Parliament, and I trust that many Members of Parliament will be inoculated with the same ideas, and that the very forcible suggestion which he has put before us of a Royal Commission being appointed to inquire into this matter, and so bring it to bear upon our colonies that a system of defence by naval volunteers may be adopted; they will at once strengthen the hands of the mother country and the colonies, and which will be a source of gratification to both. I can, from many years spent in Canada, fully confirm what you, Sir, have said and what Captain Colomb has brought out as to the warmth of the feeling which exists in those colonies towards us, especially in that great dependency of ours of British North America. There are no warmer hearts towards Britain than beat there, and it only requires this country to speak to them and to put forward some system which will draw out their wealth of men and money to enable that country to do much more than she is at present doing for her own defence. We must all feel it, and those especially who have been much in the colonies, that they are not only the peculiar glory, but that they will be the great living strength of this great country; and the more we keep warmly towards them, and the more we develop their love and feeling, the more in the end they will respond to us and become our outlying towers of strength. At this time we are reading in the papers day by day of a threatened Fenian attack on Canada, and I think some gunboats are being placed on the lakes. I have had no connection for some few years with Canada, and I do not know whether crews from our men-of-war at Quebec and Halifax have been furnished for these gunboats, but it certainly would be a most desirable thing if there were always present on the minor lakes of Canada, gunboats thoroughly manned by our Canadian comrades. It is a matter comparatively unimportant whether officered wholly or partially by our colonists. That would be easily settled by a Royal Commission; but that gunboats in a state of thorough readiness and efficiency should be there, that the spirit of our Royal Navy burning in the bosoms of these Canadians should be rightly guided, is a matter of the greatest importance, and for the whole of Canada it is most desirable that some system of naval volunteers should be adopted. I do trust that all that all of us can do, will be done to press forward the matter of a Royal Commission being appointed. Believing it of greatest moment to the future of the country that some system for the defence of our great Colonial Empire should be adopted, and that soon, I for one heartily thank you for the admirable paper you have read.

Lord Alfred Churchill: I entirely concur in the observations of Mr. Brassey as to the necessity for a Royal Commission composed of representatives of various colonies being appointed for the purpose of investigating this question, and putting it on a proper basis. The observations I wish to make apply more especially to the Australian colonies. There are several colonies within a group, at present somewhat sparsely peopled, and there may be some difficulty in organizing for them a sufficient naval force. However, I think that at present their first endeavour should be in the formation of earthworks at the entrance to the harbours. Most of their harbours are easily defended by means of artillery and torpedoes, and at present there is, I think, one ironclad there, the property of Victoria. I should hope in time we may see, if this question develops itself further, a colonial fleet of ironclads for that especial group; but I think for that purpose the colonies should federate themselves. At present they are all entirely separated one from another, having no sort of control one over another, and it would be necessary therefore for the Home Government to organize a confederation scheme for defence which should be submitted to the colonies and receive their assent. In that case you might arrive at some principle by which they should contribute to the formation of an ironclad fleet for coast purposes, and at the same time as to what amount or proportion of support or assistance should be rendered by the Royal Navy. But in order to do this, I should like to understand what is the nature of the Mutiny Act under which they can serve. Would a naval volunteer serve under the Mutiny Act of the Imperial Government, or have they a Mutiny Act of their own? It may be necessary, in order to carry out my scheme, that the Imperial Government should themselves pass a Mutiny Act applicable to the whole of that group. The same principle would apply to other colonies in other parts. I think that is a question which no doubt will come under the consideration of this Royal Commission. What we ought to do now is to

urge, as a commencement, the appointment of a Royal Commission for the purpose of commencing and investigating this thing. And the Imperial Government should themselves take the initiative in this. You cannot expect the colonies to do it for themselves. It is the duty of the Home Government to take the initiative. I cannot conclude without expressing my own thanks for the admirable paper Mr. Brassey has just read to us: it is not the only occasion on which we have felt deeply indebted to Mr. Brassey for his exertions in this direction.

Major BAYLIS, Q.C.: I have attended many lectures at this Institution, but there have been none in which I have taken a more warm and deep interest than the present. It has given me, and I am sure those who are here present, great pleasure to be here and to have heard the able paper read by Mr. Brassey. There has been much good done in this Institution by the lectures and by papers read here; they have been read in this small room, but the benefit has extended far and near. I think it may also be said of Mr. Brassey's paper that the good which has been done by reading the paper here will be extended far and wide. And it will have this advantage to us, because the good attaches to those who are bound to us, namely, our colonies. I believe the dependencies of England, when they read this paper, as emanating from the United Service Institution, will see that we are alive to the evils in which war may involve them. It is a serious matter, no doubt, for our colonies to feel and know that, when our statesmen think war may be necessary, they too may themselves be involved in war, but they will be glad to learn that this country is also sensitive to its duties, and will do everything to aid them in case of war. I know nothing that will do so much good as the paper which has been read to-day, for we know the value of the self-dependence which it inculcates, at the same time it shows that we care for their interests. I do not believe the colonies wish that England should give them all and every assistance, but what they want is to know what England expects of them, and what England will suggest to them to do for themselves, in addition to aid from the mother country. Well, now that paper suggested that they should, on their part, put their own house in order—that they should look to self-defence and self-reliance; and although, if England be involved in war, we might not look to our colonies and dependencies to defend us, they will, I believe, if necessary, Canada and all the countries connected with dear old England, always stand by her, and I was delighted to hear—unmistakably from those hearty cheers—to-day that dear old England wishes to stand by her colonies, although it has been suggested by one that England wished to be disunited from her colonies. I am sure when they feel that we are on the right course now, that we are endeavouring to suggest to them the best means by which they may be prepared in case of war, they will thank us for this paper, and I have no doubt that these valuable suggestions will lead to very much greater results. I cannot help thinking myself, in my own humble way, it will lead to a communication between the heads of the Government here and the authorities in our colonies, by which they will put their heads together to bring about the best means of rendering efficient defence to the colonies, who will suffer in case of war with England. I do not think it stops there, for I believe the colonies will do their best also to assist England. There is one thing which has relieved my mind considerably, and that is with regard to the "Alabama." We are very glad to hear that that is not a parallel case, and that what happened in the case of the "Alabama" is not possible with us now, and that England is not likely to suffer so much as the Americans suffered, or at all, from these hostile cruizers. This is a great relief to my mind, and I think we have heard very good reasons for it. Our vessels are mostly steamers, and can, therefore, take care of themselves better than was the case with the sailing vessels of the Americans, which fell a prey to the steamers.

Captain HULL, R.N., Hydrographic Department: With reference to the remarks made by Captain Bridge, I may tell him his hopes, with regard to the native sailors of India, have already been, in some respects, realized. I allude to the work now going on under the Indian Marine Survey Department, and, though it may be said that such labours are rather in the service of peace than of war, still, as the old Napoleon managed to conquer Europe by having good maps and knowing how to use them, so (and here I am sure all sailors will agree with me) success in a future naval war will, on the same grounds, greatly depend on our Captains having good

charts and knowing how to use them; therefore, I can say the native sailor of India has already done good work in the defence of that Empire, for when, through the energy of Mr. Clements Markham and Captain Taylor, the Indian Survey was established in 1875, although the Officers were supplied by the Admiralty, the men were found in India. Captain Taylor's staff has already surveyed Moulmein, Rangoon, Chittagong, False Point, Coringa, and Madras. One party is now working in Palk Strait, while Navigating Lieutenant Jarrad and another party are surveying the west coast of Hindostan, to the south of Bombay, the whole of that important part of a survey, the soundings, being taken by native sailors.

Mr. BRASSEY, in reply, said: I am very much obliged to those Officers who have spoken, for the too kind manner in which they have referred to my paper. I was much flattered by the invitation I received from the Council of this Institution inviting me to prepare a paper on the Colonial Naval Reserve; and if what I have written has had any effect in setting in motion a scheme for organizing our resources for colonial self-defence, I shall feel thankful that I have been engaged in such a useful task. The point has been referred to by several speakers as to the mode in which the expenditure necessary in carrying out such a scheme was to be dealt with. Captain Field very truly said, after all this is a matter which cannot be undertaken without an expenditure of money; and speaking as a member of the Legislature, I fully appreciate that aspect of the case, and consider that it will require very delicate handling to settle it satisfactorily. Now the foundation of a practical scheme must be, as I have endeavoured to point out, an inquiry by some competent and fully representative body, and I cannot conceive how a more effective mode of inquiry could be devised than that which would be provided by a Royal Commission. As everybody has said, the initiative must be taken by the mother country, and the best mode by which the mother country can point out what is required to be done, and bring home to the appreciation of the colonists the necessity for doing what is necessary, will be provided by giving them the full report on the subject from a Royal Commission composed of naval and military authorities and representatives of the colonists, who would be able to speak on behalf of the Colonial Government as to the ability and willingness of the taxpayers in those colonies to contribute their share. I do not think one can speak definitely on this point until we have had this essential preliminary investigation. No doubt the Commission would begin, as individual writers on this subject have begun, by laying down what are the important and strategical points which you have to defend. Some of these strategical points being coaling stations, necessary bases for naval operations, would be ports of very flourishing trade. We may fairly look, in such a case as that, to the mercantile community to contribute what is necessary. In other cases you have an important strategic point which has not a flourishing trade, which is important in a naval point of view, but not in a commercial point of view; such, for instance, as the Falkland Islands, or perhaps Vancouver. You could not reasonably expect, in such a case as that, that the expense would be met from any other source than the national exchequer. Gibraltar and Malta are important strategical points and defended, and I think very properly so, at the expense of the mother country. I now turn to the question very properly raised by Captain Field with reference to the ships. Those ships which may be considered necessary for the local defence of a flourishing commercial colony would, I think, belong to and be paid for by the colonies. Those ships which you might think it necessary to build for the local defence of places like the Falkland Islands would necessarily be paid for by the Home Government. Each case would have to be dealt with with reference to its local and special circumstances, which would be no doubt properly appreciated by the Royal Commission. I am glad that what I have said with reference to Canada and Newfoundland has been approved by those naval gentlemen who have spoken. In Canada there is a most admirable field for the organization of a naval reserve. There is a large sea-faring population, hardy and loyal, and valuable in every way for naval purposes, and from the necessity of the case unemployed during a considerable portion of the year. And when we come to consider how near the shores of Canada and Newfoundland are to this country, the facilities for communication by telegraph, the means you have of bringing to this country, if required, a very considerable force, so that in a fortnight from the time when your appreciation of the necessity had been formed, you might have your

Canadian reserves in your home ports, ready to man your ships; when you come, I say, to consider all these things, it must be acknowledged that we have too long neglected a very valuable source of naval power, and one which I trust will be developed by such an organization as the Admiralty with very small expense might very easily establish on those coasts. I am glad to be reminded by my friend Captain Bridge of the resources we have in India. India I look upon as a precious jewel in the national diadem, but it involves the country in immense responsibilities. I will not enter into the question now, but the day may come when it may be to some extent a financial burden to this country. In any case it is satisfactory to know that we not only have responsibilities and burdens to bear in connection with India, but that we derive sources of strength from our Indian connection. I was glad to hear from the observations which fell from Captain Colomb that there has been an expression of opinion officially and in Parliament in the colony of New South Wales to the effect that the colony would be willing to contribute its proportion to the maintenance of such vessels of the Royal Navy as might be permanently stationed in the colonial waters. I think we might reasonably expect such a view to be entertained in a wealthy and increasing colony. I cannot answer the questions which have been raised about the Mutiny Act as a lawyer, for although called to the Bar, I have never practised in the profession.

I thank you very much, and can only say, as I have already observed, it has been a work of great satisfaction to me to have been called upon to prepare this paper; and if it does tend to set a movement on foot which will be of practical value, I shall have been very proud to have taken some part in the matter. With reference to Parliament you must all appreciate this—it is very difficult to rouse the attention of Parliament to new subjects. In such a case as the one which we are discussing, an expression of opinion by the members of the United Service Institution is of great value as an initiatory step before bringing any proposals relating to a Colonial Naval Reserve before Parliament and the country.

The CHAIRMAN: Before I ask you to vote, as I am sure you will with acclamation, your thanks to Mr. Brassey for his very able paper, I would remind you that he possesses peculiar qualifications for speaking to us on this subject. In the first place he commands the body of Naval Artillery Volunteers in England, and he has just been round the world, where he has just visited our colonies and has seen how necessary it is that this step should be carried out. I met him at Hong Kong, a colony in which there is no volunteer force. Hong Kong is a most important British colony, and yet a man might walk for days about it without finding a fort. It is absolutely undefended, except by a few insignificant guns. Singapore is also absolutely undefended. We have in the China and Japan Seas not exactly colonies, but settlements very much of the nature of colonies, viz., settlements on the main land in the treaty ports. It is very difficult to persuade the English inhabitants to move in this matter of creating a volunteer force. Englishmen in those distant parts may fight well enough when driven into a corner, but they for various reasons will rarely combine together to form volunteer forces and submit to drill. You may find at one port some one or more enthusiasts who take the question up, and I do not know what we should do without our enthusiasts, as they form a nucleus. Thus we have, as at Shanghai, a very respectable volunteer infantry force—there is a small force of cavalry and Gatling guns—very much the kind of force that Mr. Brassey has spoken of, that is what we want in all our colonies, as I understand from his paper; and I entirely agree with him. The only difficulty is to start them. I see no reason why the Act authorizing the enrolment of volunteers should not be extended to the colonies and to the treaty ports of China and Japan, and that promptly. We are honoured to-day by the presence of some ladies. Depend upon it that there is a great deal in the power of the ladies in this question. I speak quite seriously. If the ladies in the colonies and settlements referred to would look shyly on any young men who were not enrolled in a corps of volunteers for the defence of the ladies themselves, and of the British interests, then I believe we should find all our colonies and all our outlying settlements thoroughly well defended. I have very much pleasure in returning our thanks to Mr. Brassey for his very able lecture.

LECTURE.

Friday, June 7th, 1878.

GENERAL W. A. McCLEVERTY in the Chair.

THE NATIVE STATES OF INDIA IN SUBSIDIARY ALLIANCE WITH THE BRITISH GOVERNMENT.

By Colonel G. B. MALLESON, C.S.I., late Bengal Staff Corps.

IT will be my object this afternoon to place, in a concise form, before the members of this Society, some materials from which they may draw conclusions regarding the strength of those native states in India which are in subsidiary alliance with the paramount power, and the chance of success which might await them in any contest with that power.

Throughout Hindustan there are six groups or divisions of native states. They may be classified under the names applied to the parts of the country they inhabit. These are—Rajputana, Central India, Western India, Southern India, Eastern India, Northern and North Western India. For aggressive purposes, four of these, for reasons which will be given hereafter, may be dismissed at once from consideration. There remain the fifth and sixth—Southern and Central India—comprising Haidarabad, Mysore, and Travankor, the great Maratha states of Gwaliar and Indur, the Mahomedan state of Bhopal, and the small Rajput principalities of Dhar and Diwas. Of all these, Haidarabad, Gwaliar, and Indur are alone really formidable.

Before alluding to the aggressive capacities of the states of Southern and Central India, I propose to glance at the conditions of the native states in the other parts of the country, and to show why it would be impossible for them seriously to incommode the paramount power.

In Northern and North Western India the most important native province is Kashmir. A glance at the map will show that Kashmir is shut in between lofty mountains and British territory. The mountains

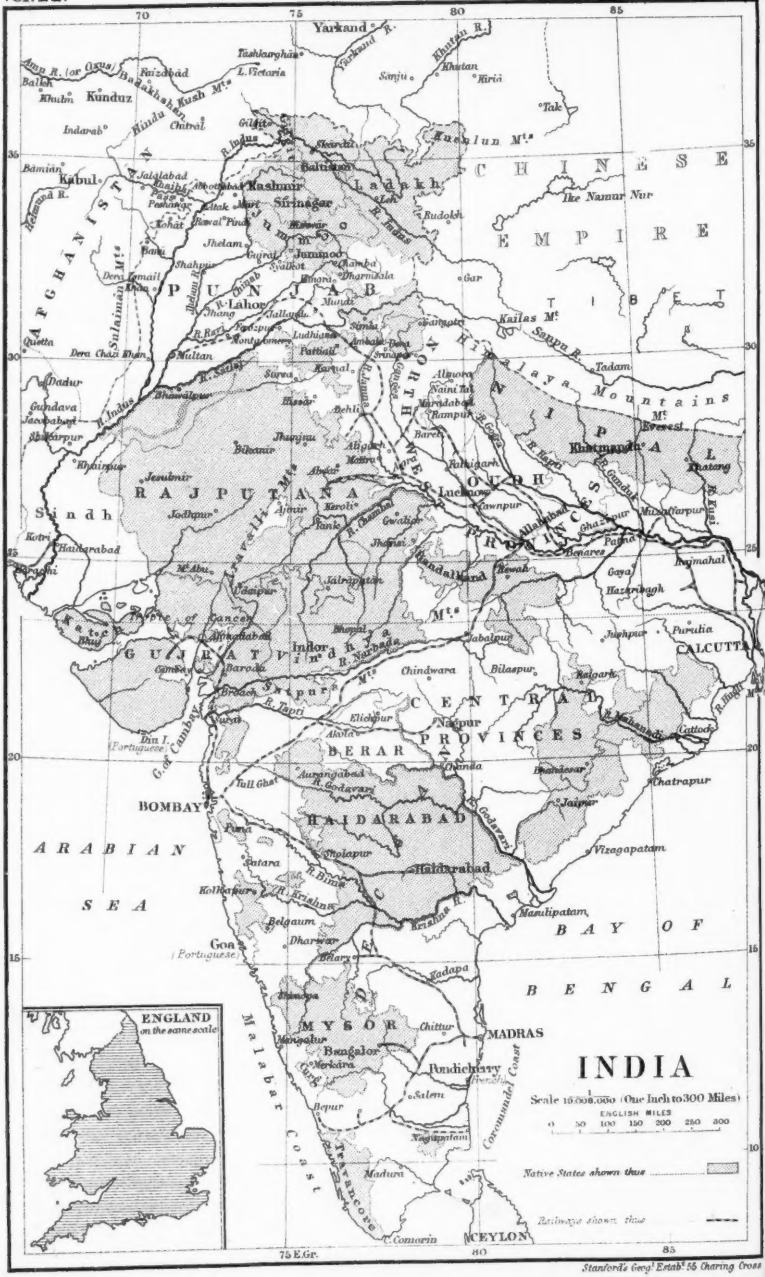
are behind it; British territory lies in its front and on either flank. It is, in fact, a portion of British territory severed from it, protected by passes inhabited by a race always content to serve, always governed by alien rulers. Kashmir has ever obeyed the ruler of the great province—the Punjab—from which it was severed in 1846. When Mogol rule was dominant in that province, Kashmir was Mogol; it subsequently succumbed to the great Sikh ruler who rescued the Punjab from Mogol sway. It was ceded to the British in 1846, and by the British was transferred, the same year, to the father of the present ruler—the Sikh chieftain of Jammu. The population is 150,000; the number of armed retainers amounts to about 20,000; the number of guns to 96. But the armed retainers include a number of undisciplined men, but slightly armed, and the guns are of the rudest description. For aggressive purposes against the British the country is as though it were disarmed, and no one is more conscious of this fact than the Raja of the country himself.

On the same side of the Satlaj as Kashmir are the states of Kapurthala, Mandi, Chamba, and Saket. The joint population of these states is under 600,000, and none of them are or could be, in the smallest degree, formidable for aggressive purposes.

The Raja of Patiala, on the south bank of the Satlaj, is more formidable. The area of his country exceeds 5,000 square miles; the population numbers more than 1,500,000. His territory joins the territories of the Rajas of Jhind and Nabha. The three Rajas are Sikhs, all descended from the same stock. The joint population of the three states just exceeds 2,000,000. Yet, of armed retainers of all sorts, there are but 3,500, and of guns but 27. The people are Sikhs, given greatly to agricultural pursuits. A glance at the map of India will show how entirely these small states are hemmed in by British territory, and how impossible it is that they could successfully lend themselves to aggressive action.

The smaller states of Kalsia, Maler Kotta, and Faridkot, may be dismissed without remark. Bhawalpur, which is more important, is mainly so because it is a link between the Punjab and Rajputana. A long narrow tract, it is bounded on the north-west by Sind and the Punjab, and on the east, south-east, and part of the south by the Rajput states of Bikanir and Jaisalmir, and by Bhattiana. The majority of the inhabitants are Mahomedans of Beluchi and Afghan descent. They number only 365,000. The Nawab or ruler has but 3,000 armed retainers of sorts, and 80 guns of kinds. Regard being had to the straggling nature of the country, its exposed position, its scanty population, Bhawalpur may be relegated to the list of those states which, under no circumstances, could be formidable for aggression.

Bhawalpur takes us from the north and north-west entirely, and leads us to Rajputana. The times have been when Rajputana concentrated within herself the fighting strength of Hindustan. They were princes and people of Rajputana who opposed the most stubborn resistance to the earliest Mahomedan invasion from the north. They were princes and people of Rajputana who first nobly resisted Akbar and the Mogols, who subsequently, submitting to the overlordship of


INDIA
Scale 16.000.000 (One Inch to 300 Miles)
ENGLISH MILES
0 50 100 150 200 250 300
Native States shown thus
Railways shown thus
ENGLAND on the same scale
AFGHANISTAN
CHINESE EMPIRE
TIBET
PUNJAB
RAJPUTANA
Sindh
GUJARAT
CENTRAL PROVINCES
BERAR
HAIDARABAD
MYSOR
BOMBAY
MADRAS
CALCUTTA
BENGAL
BAY OF
ARABIAN SEA
CEYLON
Malabar Coast
Coromandel Coast
Himalaya Mountains
Yarkand
Kabul
Kunduz
Kashmir
Srinagar
Ladakh
Lahor
Multan
Jeypur
Jodhpur
Ajmir
Indor
Haidarabad
Bangalor
Pondichery
Madras
Lucknow
Allahabad
Benares
Patna
Calcutta
Bombay
Goa
Cochin
Trivandrum
Madura
Comorin
Ceylon
Stanford's Geog.l Estab.t 55 Charing Cross

the dynasty of Baber, constituted the most important portion of the vast empire ruled from Agra and from Delhi. They were princes of Rajputana who commanded the armies of their Mogol overlord, and who brought to every field contingents of their own kith and kin who would die rather than quit the ground. In those days the Rajputs of Rajputana were the life-blood of Hindustan. Where are they now? They fell with their Mogol tyrants. The crash of the great empire they had upheld carried them away with it. They fell with its fall. The Maratha freebooters who rose, no one knew how, out of the ruin of the Mogol empire, overran their territories, and sucked out their very life-blood. History offers no nobler story than that presented by Rajputana for the period intervening between the rise of Akbar and the successful installation of Aurangzib; no sadder picture than it presented during the hundred and odd years intervening between the death of Aurangzib, in 1707, and the final crushing of the Maratha power by the Marquis of Hastings in 1817. It was the history of the decay, the ruin, the abasement of a great people.

Rajputana exists still. Its kings are the lineal descendants of the heroes who flourished long prior to the time of Akbar. Its people are the sons of those who defended Chitor, and who fought for empire at Kanua and Biana. But her life has died out. The good blood that was in the veins is now dry and hard. The charms of opium have succeeded to the song of battle, and the pleasures of the harem to the joys of strife.

Yet it may excite some surprise to hear that throughout Rajputana at the present moment there are 93,000 armed retainers of whom at least one-fourth are horsemen, and about 2,000 guns of sorts. But the remark made regarding the guns and the retainers of the Raja of Kashmir applies equally to these guns and to these men. The guns are all of the oldest pattern and for the most part small and worthless. The armed retainers are not soldiers, nor do they pretend to be so. At the most they have a sword or a matchlock. They have never been drilled, and in no respect are they formidable.

There are in Rajputana eighteen states in subsidiary alliance with the British Government. They are called Udaipur, Jaipur, Jodhpur, Bundi, Kota, Jhalawar, Karauli, Kishngarh, Dholpur, Bharatpur, Alwar, Bikanir, Jaisalmir, Sirohi, Dongarpur, Banswara, Pertabgarh, and Tonk. Of these the last alone is ruled by a Mahomedan—the descendant of the famous freebooter, Amir Khan; Bharatpur is governed by a Jat prince; the other states by Rajputs. The population is mainly Rajput. It is among these eighteen states that are apportioned the 93,000 armed retainers and the 2,000 guns of which I have made mention. To utilize these men and these guns, if indeed they were capable of being utilized for aggression against the paramount power, the union and combined action of eighteen different independent states would be necessary. The history of the past in India shows such union and such combined action to be impossible. Ceremonial and etiquette constantly interfere even with social intercourse amongst these high caste princes; much more would it prevent joint and secret action. Of Rajputana, then, extensive as is the country, brave and

warlike as were once the people, it may be said that even were her princes united she would not be formidable for aggression, and that, divided into eighteen states independent of each other, she is powerless.

Turning now to Western India I find here five principal states, the remainder being minor and subsidiary. The five principal states are Barodah, Kolhapur, Sawant-wari, Kachh, and Kathiwar. None of these are formidable for aggressive purposes. Barodah, with a population somewhat below 2,000,000, maintains an armed force of about 14,000 men and 30 guns. Some of these 14,000 men are well dressed and well drilled, but they are essentially show soldiers. The Gaikwars of Barodah have never played a prominent part in the history of India; they have been always second to some one else. They are so now to the English, and they will, if they are wise, be content to remain so.

Kolhapur, though ruled by a descendant of the younger branch of the family which gave birth to the famous Sivaji, is even more debarred than is Barodah from aggressive power. Disaffection or misgovernment in this state has always been easily suppressed by a small British force. The armed retainers number about 1,600 men, and though there are said to be 258 guns in the country, none of them are worth much. Sawant-wari, Kachh, Kathiwar, and the minor states may be summarily dismissed without remark.

Passing from Western to Eastern India we find there only petty chieftains, none of whom possess power for aggression. The states are all mediatized or minor, and their rulers, though nominally Rajas, are really only large landowners.

In Southern India, as perhaps in all India, the most formidable state is Haidarabad. Mysore, which in the last century, under its Mahomedan sovereign, used to threaten Madras and lay claim to give law to the southern portion of the peninsula, has long been powerless for aggression. The masterly policy of Marquis Wellesley reduced her in 1799 to nothingness. She was shorn of half her dominions, and salient positions in her territory were occupied by British troops. The misgovernment of the representative of the restored Hindu ruler rendered it necessary for the British, in 1833, to tighten their hold on the country. British troops, native and European, occupy Bangalor, and a station close to the far-famed but dismantled fortress of Seringapatam. The once renowned horsemen of Mysore are now under British command. The armed retainers of the minor Raja number but 1,000 infantry, some 35 cavalry, only half of whom are mounted, and 6 small guns. The people are industrious, much given to the cultivation of the soil, the yield of which is ordinarily far more than sufficient for the wants of the population. Out of a population of 5,000,000, the Hindus greatly predominate.

This short summary of the present state of Mysore renders it almost unnecessary for me to state that for purposes of aggression against the paramount power she is not to be counted upon.

Similarly with regard to Travankor. The armed force at her ruler's disposal does not exceed that at the disposal of the Raja of Mysore. The people, almost entirely Hindus, are unwarlike in character, and throughout their history have never carried on a war of aggression.

The same remark applies to the people of the small neighbouring state of Kochin. The armed force in this state amounts only to 300 men, and it has but 3 small guns.

It is different in Haidarabad. Independently of a contingent force of 5,000 infantry, 2,000 cavalry, and four batteries of artillery, commanded by British Officers, and paid for out of the revenue of lands assigned for that purpose by the Nizam, that prince maintains a separate force little short of 50,000 men. Of these nearly 37,000 are infantry, the cavalry amount to 8,200, and there are 725 guns. These troops are not the rabble which go to form the armed retinue of some of the princes of whom I have spoken. Amongst them are Arabs and Africans, strong of limb, active by habit, and turbulent by nature. These for the most part occupy the city of Haidarabad, and in periods of excitement they have shown themselves extremely difficult to restrain. In the crisis of 1857 they burst the bonds that held them back and attacked the British Resident in his palace. The period was critical. It was the middle of July when the disasters of Mirath, of Delhi, of Cawnpore, of Lukhnow, were as yet unavenged, and when a strong feeling pervaded the native mind that the knell of British rule had sounded. Had Haidarabad, with its population of over 10,000,000 and its army of 50,000 men, turned against us at that moment, it is difficult to see how we could have held Southern and Western India. It happened fortunately that the Prime Minister of the Nizam, the present Sir Salar Jung, was a far-seeing statesman. He believed in the fortunes of Great Britain, and he felt that if revolt were to be triumphant it was neither the Nizam nor the Mahomedan nobles of Haidarabad who would reap the fruits. Without hesitation, then, he summoned troops upon whom he could depend, attacked the rebels, and dispersed them. From that moment the excitement subsided; Sir Salar Jung was supreme, and he gave all his influence to the maintenance of a cordial understanding with the British.

Still it is undeniable that for aggressive purposes Haidarabad might be formidable. Alone, I think, of all the reigning native dynasties in India, the Nizam occupies towards the British the position which his predecessors—the Subadars of the Dekhan—held towards the Great Mogol. The large colony of Mahomedan nobles who form the court of the Nizam are, for the most part, descendants of the nobles who, in the days of Mogol rule, followed the Subadar or Viceroy from Delhi to Haidarabad. The people number amongst them many Mahomedans, but the majority are Hindus. It has so happened that the ruler of Haidarabad has never been embroiled with the English. Inclined, during the war for empire in Southern India between the French and the English, to side with the former, they accepted the decision of fortune and remained—with a slight exception in 1767 of which they speedily repented—true to the English overlordship. The reigning family has been guiltless of producing one man of real ability, and the British Resident on the spot has always exercised great influence in directing the policy of the representative of the house. Still it must never be forgotten, in computing the dangers of India from within, that Haidarabad is a compact state ruled by Mahomedans,

with a population of nearly 11,000,000—an independent Army of nearly 50,000 men, many of them chosen troops, and 725 guns.

Inferior to Haidarabad in extent, in the amount of its population, and in wealth, though scarcely inferior to it in aggressive power, is the Maratha state called Gwaliar. The past history of this state, and the past history of the house of Sindia which rules it, make it in a certain view more dangerous than the other. The house of Sindia has a past more brilliant, more powerful, more alluring than the present. It was the greatest representative of that house, Madhaji, who struck the blow which lodged the Maratha in the palaces of the Mogols. It was the successor of Madhaji who, in 1803, contested the empire of Hindustan with the British, and who, dreaming of renewing the struggle in 1817, was outwitted by the Marquis of Hastings and compelled to recognise the supremacy of his successful rivals. In the minds of capable members of ruling families that have been great, the past is always a dominating power. The present ruler of Gwaliar is pre-eminently a capable man; he is above all things a soldier; he understands how to manœuvre troops; he is alive to the improvements effected of late years in the scientific branches of the military profession, and he has ever shown himself anxious to secure for himself the advantage of those improvements. He occupies a central position in India; he is in the prime and perfection of manhood; he is his own Prime Minister, and within his own dominions absolute ruler.

The dominions of Sindia comprise 33,000 square miles. The population, mostly Hindu, numbers nearly 3,000,000. The annual revenue is about 1,000,000*l*. By the last treaty with the Government of India Sindia was empowered to maintain a regular army of 5,000 men and 36 guns. He does maintain a regular army of that strength, but in addition to it he can dispose of an irregular force numbering about 17,000 infantry and cavalry, and 170 guns of sorts.

The past history of the wars of Sindia with the English gives an apt illustration of the advantage accruing to the native army from the presence in its ranks of European officers. Until the battles with the Sikhs on the banks of the Satlaj in 1846, there had been no more hotly contested engagement than the battle of Laswari. Laswari was fought on the 1st November, 1803. The Maratha army numbered but 9,000 men, of whom 1,500 were cavalry, and they had 74 guns. But the 7,000 men who composed the infantry were the picked soldiers of India. They had been trained in the European system by the famous De Boigne, and were armed with the best muskets then procurable. Until within a few weeks of the battle the regiments had been drilled and commanded by European officers. Under the leading of these officers they had beaten every enemy whom they had encountered. But their European officers, ready to lead them against the native enemies of Sindia, had felt a great repugnance to do battle against English troops. Possibly they were not uninfluenced by the offers made them on the declaration of war by Marquis Wellesley—offers which secured to them their property and a provision for life. This at least is certain, that they left the trained battalions to shift for themselves. Here, then, were 9,000 trained troops—splendidly trained

troops—but with no Europeans to guide them. On the morning of 1st November Lord Lake attacked them in a very strong position with his cavalry, composed of three regiments of dragoons and five of native cavalry. The position of the Marathas was so strong, and they had been trained so well, that the cavalry attack was repulsed, and Lord Lake was constrained to draw off and await the arrival of his infantry. At noon the infantry, who had marched twenty-five miles, came up. They consisted of one English regiment, the 76th, and four native regiments—in all about 4,000 men. Lord Lake's whole force, including cavalry and artillery, numbered about 7,000 men. The disparity then was not very great. It is interesting, especially at the present day, to notice how these trained sepoys, commanded by their own countrymen, met and encountered the English soldiers, and the sepoys commanded by English officers.

Lord Lake allowed his soldiers an hour to rest and take their food. He then formed his infantry into two columns, the first of which was to turn the enemy's right concentrated round the village of Mohalpur, the second was to support it. Whilst this real attack was taking place one-half of the cavalry were to threaten the enemy's left, whilst the other half should hold itself in readiness to take advantage of any confusion in the hostile ranks.

These dispositions having been effected, the first column moved on; but its advance was no sooner noticed by the Marathas than they threw back their right, and concentrated on the advancing column the whole fire of their artillery. The fire was most effective. The heads of the advancing column were smitten down, and the losses were enormous. But Lord Lake was aware that the one way to beat Asiatics was to move straight on; the column, therefore, still pressed onward. In vain did the enemy, suspending for a moment his artillery fire, send his cavalry to check the advance. The cavalry were repulsed; the column still pressed on and deployed, whilst our cavalry charged the guns. Admirably trained, formed of the same material as the majority of the attacking force, slightly superior in numbers, occupying a strong position, the enemy showed on this occasion a courage and resolution scarcely to be surpassed; but their leaders were not up to the mark. They had no trained European officers to call upon them to do the right thing at the right moment. In the contest that followed this deficiency decided the day. Whilst their cavalry had fallen back ours had advanced and ridden over the gunners. Our infantry, following up the cavalry charge, took possession of the greater part of the guns. The two arms, acting in concert, then drove the enemy from every position; not, however, before each had been most stubbornly contested.

I have mentioned Laswari as affording the best example of a battle fought by a purely Maratha army against a force of combined European and native troops, the latter led by English officers. It proves, as the actions on the Satlaj and in the Punjab proved subsequently, that native soldiers will fight splendidly, even against Europeans, that they only require to be led. Side by side with English troops, and opposed to an enemy whom those English troops are eager to encounter, they would vie with their English comrades. This spirit of their

English comrades would communicate itself to them and would animate every nerve. At Laswari fighting against the English without officers to lead them, they displayed, writes the historian and eye witness, Major Thorn, "a firmness of resolution and contempt of death "which could not fail to command the admiration of their opponents." But it should never be forgotten that of the regiments opposed to them but one was British. The others were their own countrymen, not better drilled than they were, but led by English officers.

Subsequently to the campaign which the battle of Laswari virtually ended, Sindia but once again met the English in the field. This happened in 1843. But the circumstances were peculiar. Intriguers had taken advantage of the minority of the present Maharaja to embroil the country with the British. Their army had lost the training imparted to it by De Boigne and his followers. They were a rabble possessing some good guns. Met by the English at Maharajpur they still showed courage, but they made no stand at all to be compared with that at Laswari.

During the mutiny, the Maharaja, in spite of the fact that his very kinsmen revolted against him, remained faithful to the British. His troops turned against us. But it was as an ally of the Maharaja that Lord Strathnairn stormed his capital in 1858, and that subsequently Lord Napier of Magdala restored order in his dominions.

The Maharaja is a good soldier. He has at his disposal, as I have already stated, a small well-disciplined force of 5,000 men and 36 guns, and he can dispose of an irregular army of 17,000 men and 170 guns. Granting that he were ill-disposed towards the British, his means of aggression are not very formidable. It is well, too, to notice that they are not without a very powerful counterpoise. The famous fortress of Gwaliar, overlooking his capital, is occupied by British troops, whilst a small but admirably equipped force of the same troops of all arms occupies Morar, a station also within sight of his capital. So long as these positions are occupied the Maharaja is debarred from aggression. As well might a man with disease of the heart attempt violent exercise. In occupying Morar and the fortress of Gwaliar we prevent the possibility of extraordinary locomotion on the part of the owner.

Far less formidable for aggressive purposes than Sindia is his fellow Maratha, Holkar. Holkar rules over a straggling territory in Central India containing about 8,400 square miles and occupied by a population of little over half a million, mostly Hindus. His armed retainers number 8,500, and he has 102 guns of sorts. The instincts of the present representative of the house are rather money making than martial.

The Holkars of Indore have indeed twice felt the power of the English. In 1804-5 after a campaign which had begun by the enforced retreat of Colonel Monson, for want, Rao Holkar fled completely beaten to the Punjab, whence he returned—to use his own words—"with his kingdom on his saddle's bow" to the conqueror. In December, 1817, the Pathan chiefs, who during the minority of the minor Raja, swayed the fortunes of the state, encountered the English at Meludpur. They were hopelessly beaten. One day sufficed to place

the dominions of Holkar at the feet of the British. Holkar, then, individually as a state, can scarcely be regarded as formidable for aggressive purposes.

One word regarding another state in Central India—I mean Bhopal. This country adjoins Holkar's dominions to the eastward of them. Its ruler and the court are Mahomedans, as are likewise a large number of the population of the chief town. It contains 6,760 square miles, and nearly 700,000 inhabitants. The number of armed retainers maintained by the Begam is about 6,000, and she has 39 guns of sorts. Bhopal has from the earliest times displayed an unswerving friendship for and loyalty to the British. In the most trying times of the Mutiny, when other states wavered Bhopal was true. The dynasty which rules it has never shown any love for aggression. A small colony of Mahomedans planted in the midst of a large Hindu community at the time of the break-up of the Mogol Empire, the descendants of that colony have been satisfied to maintain the dominion of their fathers. The circumstances of their origin may account to some extent for their early sympathy with the British. Afghans in Central India were as much foreigners to the Hindu population as were the English.

I have now passed in view singly one after another the only native states in Hindustan which might possess the power, had they the will, to cause serious trouble to their overlord. Singly, it will be seen they are comparatively harmless. But to the reader who, glancing at the table which forms an appendix to this lecture, may notice that the native states of India, united, can dispose of 64,172 cavalry; 241,063 foot soldiers; and 9,390 trained artillerymen working 5,252 guns; the question might arise as to how the British Government could meet this enormous force if its component parts were to combine against us.

In meeting this question the first point to be remarked is that they never would unite. It was the dream of Madhaji Sindia, the greatest statesman India ever produced, to combine during the last decade of the last century all India against the British. He found the task impossible. Whilst he was maturing matters to this great end one chieftain or other would break away and spoil the scheme by too precipitate action. Sometimes it was Tippu Sahib, sometimes the Peshwa. These gave the English the chance of beating them in detail. Madhaji died just when he had attained the pinnacle of greatness and when it might have been possible for him to put his scheme into action. It was not till seven years after his death that the mind of his successor, Daolat Rao, grasped the value of Madhaji's idea. At that time he and Jaswant Rao Holkar virtually governed Hindustan. Jaswant Rao was as completely penetrated as was Sindia with the conviction that if they did not beat the English the English would obtain supremacy in India. But Jaswant Rao was jealous of Sindia. Though urgently pressed to act, and though promising to act, his jealousy kept him quiet when Sindia battled with the common enemy. He experienced far more pleasure in seeing Sindia defeated than he would have felt in hearing of his victory. But no sooner was Sindia crushed than the dread of the English returned and Holkar precipitated with them a war in which

he was all but annihilated. Now both these chieftains were Marathas. If two princes of the same race, having the same interests to defend, found themselves unable to coalesce against a common enemy, is it probable that princes of different races, divided from each other by religion, by descent, by the memories of past wrongs, could join for the same purpose? It is impossible. I have mentioned but one instance of the action natural to native chiefs; but every period, every age of Indian history teems with similar examples. It was so under the Mogol likewise. The feeling of the native states towards each other is well illustrated by the speech made by Charles II to the Duke of York. "They will never wish me dead to make you King." No single native state would wish the supremacy of England destroyed to bestow that supremacy on another native state. One reason for the general acceptance of the supremacy of England is that that supremacy keeps in check rival native claims.

But, granted that union were possible, what then? There is no answer like a practical answer, and the answer to even a greater difficulty was given in 1857. In that year the fortresses, the arsenals, the magazines in India were wholly or partly garrisoned or guarded by native troops. Two-thirds of the guns were manned by them. The native troops were to the European troops in the proportion of fourteen to one. The bulk of the native troops, men trained by us, armed by us, and able to dispose, to a considerable extent, of our fortresses, our guns, and our magazines, rose in revolt. They had all the advantages arising from a surprise. We were unprepared, yet the handful of Europeans that were on the spot kept them in check till reinforcements could arrive by a long sea route from England.

In the present day we possess arms of precision such as the native princes have not; we guard our fortresses, our magazines, our arsenals with Europeans; we have cannon beside which the cannon of the native princes are exploded weapons; the Suez Canal is available for the transport of our troops. If the trained and disciplined, well-armed and well-provided sepoys failed in 1857, what chance would the combined rabble of the native princes have in 1878? Were they to attempt the chance Assaye and Argaum would be repeated.

But they will not attempt it. Undoubtedly there are men amongst them who have a past and who would chafe under any overlord. But these men feel that some overlordship is necessary for their own security. The present Maharaja of Gwaliar had no sympathy with the revolt of 1857, mainly because the sepoys connected that movement with the reassertion of the Mogol dynasty. The triumph of that dynasty would have been no triumph for Sindia. It would have substituted a Mogol overlord for an European overlord—a lawless tyrant for a just and considerate suzerain.

The assertion of the English overlordship by the assumption by Her Majesty of the title of Empress in 1876, was a measure not only politic but imperatively necessary. The more it is brought home to the native princes that England intends to be overlord in name as well as in deed, the greater will be their respect for England—the more solid their conviction that they are not independent but vassal princes.

It was the absence of this direct assumption of overlordship that had encouraged men, disaffected to the English, to rouse in the minds of the native princes aspirations to which they had no claim. It is within my knowledge that the summons to the Durbar, held at Delhi on the 1st January, 1877, caused more than one native prince to communicate his ideas on the subject to another native prince. The result of this intercommunication was a conviction that attendance at that Durbar was imperative.

The proclamation of the title, then, followed by the Durbar, cleared away a delusion which might have been dangerous. The position of the native princes was brought home to each one of them. They all, by their attendance, acknowledged the overlordship of England.

It must tend to the general safety of the country when men in that position are brought to see themselves as others see them, and not with the eyes of their flatterers. The Mutiny, the opening of the Suez Canal, the increasing knowledge of the English language, have made the princes of India more thoroughly acquainted with the power and resources of England than were the wisest of their predecessors. Many of them are now, all of them in time will become, of the same opinion as the late astute ruler of Afghanistan, Dost Mahomed Khan. It happened that during the Mutiny year, 1857, three British officers were at Kandahar on a political mission. Haidar Khan, then Governor of that place, sent word to his father, Dost Mahomed, that news had come from India that all the English there had been murdered: "Had I not better cut the throats of these three?" Dost Mahomed replied: "It is useless; I know these English well. It may "be true that all those in India have been murdered, but they will "come in thousands from beyond the sea and reconquer the country. "Better leave these three alone."

The splendid stand made by England during the last four months against the threatened aggressions of Russia, will go far to impress this idea on the minds of the princes of India, whilst the employment of native troops in Europe will tend to cement together the bonds of the severed branches of the great Aryan race. I have enumerated the strength of the native princes and their powers for aggression; but I am convinced that every succeeding year will increase their loyalty to our Queen and their Empress—their desire to uphold the great Empire of which they form a valuable and necessary part.

Appendix.

Showing the War Material at the disposal of the Native Princes of India.

States.	Guns.	Infantry.	Cavalry.
Rajputana:			
Udaipur	538	15,100	6,240
Jaipur	312	10,500	3,530
Jodhpur	220	4,000	5,600
Bundi	68	2,000	200
Kota	119	4,600	700
Jhalawar	90	3,500	400
Tonk	53	2,288	430
Karauli	40	3,200	400
Kishugarh	35	2,000	150
Dhalpur	32	3,650	610
Bharatpur	38	8,500	1,460
Alwar	351	5,633	2,280
Bikanir	53	940	670
Jaisalmir	12	400	500
Sirohi	—	350	375
Dongarpur	4	632	57
Banswara	3	500	60
Partabgarh	12	950	275
Central India:			
Gwaliar	210	16,050	6,068
Indor	102	5,500	3,000
Bhopal	39	4,766	1,194
Dhar	4	790	370
Dewas	,,	,,	,,
Rewa	35	2,000	905
Other States in Bandalkhand	421	22,163	2,677
Western India:			
Barodah	30	11,000	3,098
Kolhapur	258	1,502	154
Kachh	38	600	300
Kathiwar	508	15,306	3,033
Southern India:			
Haidarabad	725	36,890	8,202
Mysore	6	1,000	35
Travankur	6	1,211	60
Kochin	3	300	—
Northern India:			
Cis-Satlaj States	141	7,185	3,191
Kashmir	96	18,436	1,393
Trans-Satlaj States	27	3,275	300
Bhawalpur	80	2,484	360
Petty States	302	18,000	4,000

The Chairman: Before proposing a vote of thanks to Colonel Malleson for his very interesting lecture, you will perhaps allow me to make a few remarks, in order to substantiate the statement that he has made, especially with regard to the province of Hydrabad, the most formidable of these native powers. There is no doubt that the natives of the province and city of Hydrabad are among the most warlike, turbulent, and robust men in India, comprising Arabs, Afghans, Pathans, Seedes,

Rohillas, Rajpoots, and other warlike races. With regard to the 725 guns, of which Colonel Malleson has spoken, I had an opportunity of seeing specimens of these guns about the year 1870, when I first reviewed a portion of these troops in the city of Hydrabad. I think I saw somewhere about 18,000 men, and I was shown about 30 guns. Some of them were guns that had done duty at the siege of Seringapatam. I also saw some guns from Golconda which they told me had been brought from Persia in the time of the first Nizam, about the year 1720. There is no doubt the greater portion of the guns are perfectly useless. The Army is entirely undisciplined and unofficered, in the proper sense of the term, except a small force called the reformed army that Salar Jung has placed under the control of European Officers; but really from what I saw of specimens of the 725 guns, I do not believe there is a single one that is of any use, and there were no arms of precision. I will now invite any gentleman to put any questions to Colonel Malleson on this subject, and no doubt he will be very happy to reply to them.

Captain COLLEN, Bengal Staff Corps, Assistant Secretary, Military Department: I have listened with very great attention to the able lecture delivered by Colonel Malleson, and although I had no intention of speaking when I came down, there are one or two points I should like to observe upon. I gather from the lecture that Colonel Malleson believes the armies of the native states of India could not be combined for the purpose of aggression, and I am sure that we must all agree with him in that. But he did not, I think, make sufficient of a point which I would venture to bring to your notice. Many of these native states have, as Colonel Malleson told us, forces of considerable strength; and although not of great warlike power, yet we must admit that though we may term them by the name of "rabble," they are quite sufficient to disturb order in India, if at any juncture of circumstances a portion of the British forces were withdrawn from that Empire. That is a point on which I wish to lay stress. I have only to say, as far as regards the welfare of the native states themselves, that it would be to their great benefit if their forces were reduced to a minimum. They spend a great deal of money on these men, and as Colonel Malleson pointed out, they are of very little use for military purposes. To a certain extent I have always understood, and I have seen portions of most of these forces, they are used as police, and as guards for treasure and so on. Up to that point they are useful, but for military purposes they are quite out of place. They have nobody against whom they could fight except the paramount power, England. My own earnest hope is, and I gather from the newspapers that such a measure is contemplated, that the forces of the native states of India may be reduced to the least possible strength, consistent with our treaty obligations with those states, and with the dignity of those who have been loyal and faithful to us.

Captain WEMYSS: I might mention that the regular horsemen in Barodah were the most active swordsmen I have seen anywhere.

General CAVENAGH: I think we must all fully agree with Colonel Malleson in his remarks as to the inability of the forces of the native states to make any aggressive movement upon the paramount power so long as those forces are without proper leaders. It is, however, a question whether, in the event of our ever allowing native states to take into their service men who would be able to train and discipline their troops against us, they would not in the time of emergency be found a thorn in our side. It is also possibly a question whether we ourselves are wise in training up as leaders, natives who may at any time become hostile to us. In support of what Colonel Malleson has stated with regard to the want of efficient commanders amongst the Marathas at Maharajpur,[1] I may mention an incident that occurred to a man in my own regiment, and although a large body of Maratha cavalry were present, they took no part in the action. The troopers were many of them friends and relatives of the very men we were leading. After the battle, when one of our men met a cousin

[1] Notwithstanding this disadvantage, the Maratha artillery and infantry fought well, and stoutly defended their positions; of the British troops, upon whom the brunt of the action fell, about one in five were rendered *hors de combat*; the regiments that suffered the most were the 39th Foot, 214; 40th Foot, 182; 16th Native Infantry, 180.

of his who belonged to the opposite force, he put the question to him, why, with numbers so much greater than ours, they never charged us? The reply shows conclusively what Colonel Malleson has pointed out, that it is in leaders that the native troops are deficient. The answer was given in the shape of an inquiry: "Where "were your European Officers?" Upon which, our man replied: "Our Officers "led their troops and squadrons." "Our Officers," the Maratha replied, "were in "the rear." As to the power of the troops of the native states to meet British troops in the open field, without leaders, it would be impossible; but I think that the British Government ought not to lose sight of the fact that, considering their large numbers, in the event of any general rising, which of course wise statesmen will always contemplate, for it may occur owing to intrigues that may be carried on against us—these men would act upon our flanks and interfere with our communications; and although they might never be arrayed against us in a pitched battle, they would materially affect our operations, and possibly lead to our suffering serious and great loss.

Mr. HADDAN, C.E.: On the question of the value of Indian irregulars I may perhaps mention one experience I gained in India some seven or eight years ago. During the progress of a railway which was being surveyed in Salar Jung's territory, we were supplied with a guard of so-called grenadiers, which numbered twelve in all, and which mustered about one complete uniform among the number; and when there was a review, I think about two of them could muster boots. The flintlocks were destroyed by time, and they used matchlocks. At the prize meeting, held when our Staff assembled, which was not, however, quite up to Wimbledon, they could not hit a chattee at twenty yards. I happen also to know that Scindia and Holkar, and the princes in general, were very particular about the number of guns that should be fired in their honour at the great Durbar: and Scindia thought he had managed it completely when he was assured of twenty-three, which was rather more than a Royal salute. It was only, however, when 101 were fired for the Kaiser-i-Hind, that he found the real distance which, in our opinion, exists between himself and royalty.

The CHAIRMAN: I think it is my duty now to move a vote of thanks to Colonel Malleson for his very interesting lecture.

Colonel MALLESON: I beg to thank you, Sir, and the ladies and gentlemen present, for the manner in which you have received the lecture which I have given. It has been a great pleasure to me to hear that the remarks which I made regarding the difference between the behaviour of the Marathas at Laswári and at Maharajpur have been confirmed by a gallant Officer who played a very distinguished part in the latter engagement, and who, I think, left his leg on the field. I beg further to remark, that I entirely agree with the gallant Officer who rose first, Captain Collen, in the observations that fell from him regarding the power possessed by the levies of the native troops to annoy us very considerably, in case there should be a disturbance in India. I also entirely agree with him in the hope he expressed, that the levies of those provinces would be reduced from their present extravagant number to one more within compass, so that all danger of any such disturbance on their part should be taken away. I have only to express to the meeting my grateful thanks for the attention with which you have listened to me.

LECTURE.

Friday, June 14th, 1878.

Colonel H. YULE, C.B., R.E., &c., &c., in the Chair.

ON COMMUNICATIONS WITH BRITISH INDIA UNDER POSSIBLE CONTINGENCIES.

By Major-General Sir FREDERIC J. GOLDSMID, C.B., K.C.S.I.

THERE can be no doubt that the possession of so vast a territory as British India brings with it many serious responsibilities. Among the more recent illustrations of this truth is the mode in which Government has dealt with the famine. It has administered to the wants of the hungry in the far East as it would have done at home; it has acknowledged the principle that a sovereign rule must be a paternal rule; that starving subjects must be fed as well as starving children; and that without distinction of distance, colour, or creed. We do not say that nothing is received in return for this expensive fulfilment of sympathetic duties. If England had only, on the credit side, a large field of honourable employment for her sons, and the *prestige* of a vast empire, it would be much; but she has these and more: she has an Asiatic army, to appear at a sudden call in this as well as any other quarter of the globe; thousands of Oriental soldiers to rise up and do her work in the West, should their presence be required on an emergency.

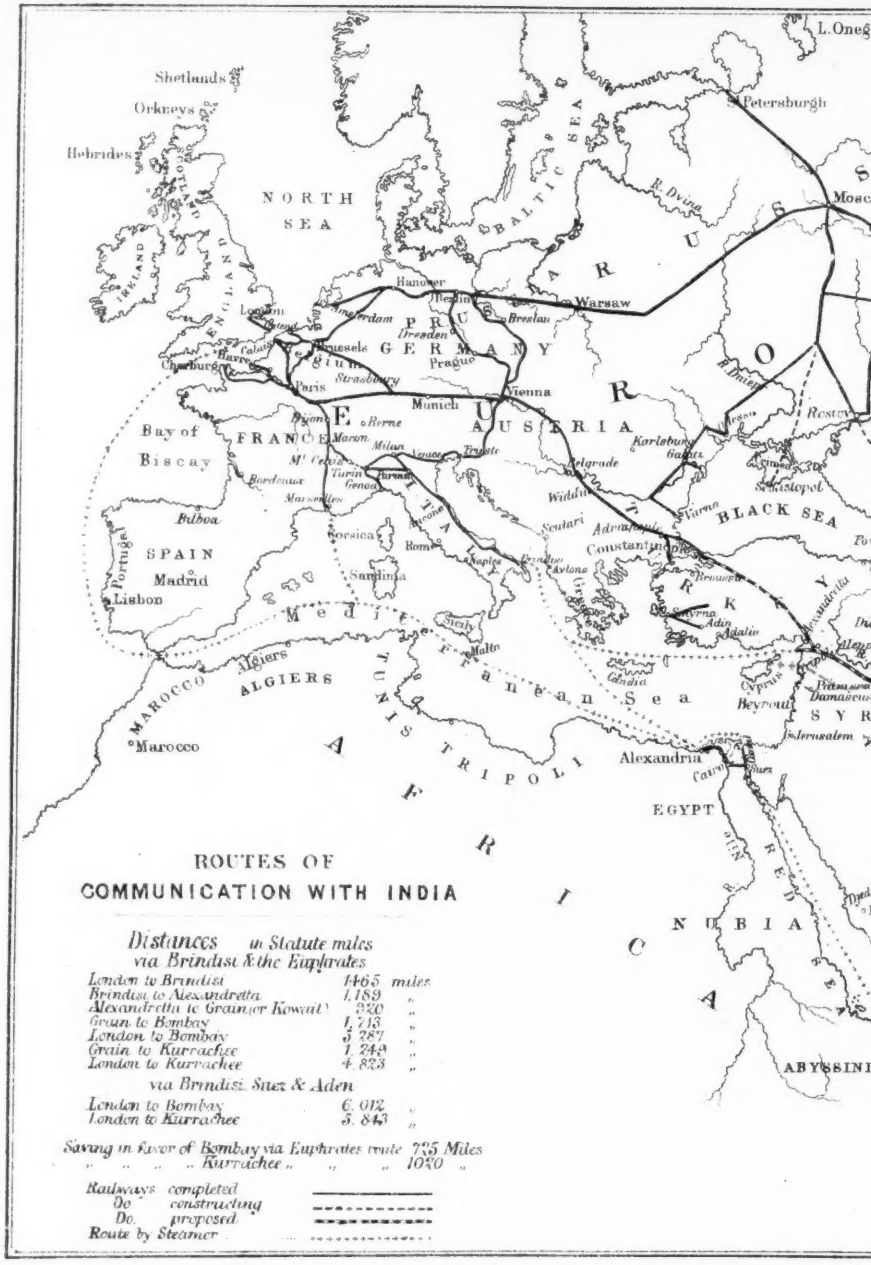
But one of our main responsibilities is that of communication. England must not only have a link with India by telegraph; she must also be always able to reach her practically and in substance, and the long sea route is out of the question in these days of rapidity of movement, when action is worthless unless it is independent of time, when practice treads on the heels of theory, and when execution almost overtakes design. To see how this is to be attained under all circumstances, independently of a long sea route, is then the object proposed in the present paper. In order to steer clear as much as possible of shoals in the shape of politics, I will, in the first instance, talk of countries and people as though we were on the best of terms with all; as if they were at our disposal to traverse and re-traverse with the same facility as we draw lines on the mute map before us; as if all we had to contend with

were physical difficulties and commercial considerations. I would ask leave, however, to include in the term "physical" the obstructiveness of robbers or of lawless tribes.

Nearly three years ago I had the honour of delivering a lecture in these rooms "On certain Roads between Turkistan and India, indepen-"dent of the Oxus or of any Oxus Boundary." The two roads then described were supposed to connect the seaboard of Northern Persia with the Lower Indus, but the distances were great. The one from Enzeli, in the south-west corner of the Caspian, passing through Eastern Persia, Western Baluchistan, and Eastern Makran, was estimated at 1,870 miles; the other, from Bandar-i-gez, on the south-eastern shores of the Caspian, passing through Northern and Eastern Persia and Afghanistan, was reckoned 150 miles longer. We might possibly, as I represented at the time, reduce the two lines to much the same figure, *i.e.*, a maximum of 1,800, or a minimum of 1,500 miles. But then the Caspian is at an immense distance from England, and these roads, however important for an invading army, are not to be thought of as a means of passing British troops to and fro between Europe and Asia. In fact, I may state at once a proposition, the soundness of which should, without demonstration, be apparent to all present, that anything like complete overland communication of such a nature, if to be considered at all, must be considered as practicable by railway. How India is to be reached by this means is what we have now to examine, and in doing so I am quite aware that we shall tread upon somewhat debateable ground.

In the first place, unless the British Channel were bridged over or tunnelled under, we must use transports for crossing it; and the embarkation of troops at all would involve much trouble, provision, and expense; so much so, indeed, that the loss of a few days in a preliminary sea voyage might be found expedient, and the land-starting-point fixed in the Mediterranean, instead of a French or Belgian port. But in order to get some practical acquaintance with our proposed lines, whether in Europe or Asia, let us glance at what has been done in this respect by the telegraph.

Twenty years ago the revolt in India had been barely suppressed; there was no such institution as a telegraph to India, or even half-way to India, though the Red Sea cable may have been under preparation for laying and collapsing, and the Government were seeking, more or less in the dark, the means of meeting a requirement which events had shown to be most urgent. Ten years later, the failure of the first Red Sea cable had been nigh forgotten; the Government Officers had carried a cable from Karachi to Bushahr and the head of the Persian Gulf, had constructed land lines in Persia and Makran; and measures were being taken to secure safe and rapid communication with the cables through Europe and Asiatic Turkey on one side, and Europe and Persia on the other—amid loud cries, be it said, of dissatisfaction at the time occupied in perfecting so delicate and intricate a process. To-day there is a Red Sea cable and a land telegraph communicating with the Government cables, the successful working of which may be certified by the conclusive and convincing evidence of the daily press. As the



ROUTES OF COMMUNICATION WITH INDIA

Distances in Statute miles

via Brindisi & the Euphrates

London to Brindisi	1465	miles
Brindisi to Alexandretta	1,189	„
Alexandretta to Grain (or Kowait)	220	„
Grain to Bombay	1,713	„
London to Bombay	5,287	„
Grain to Kurrachee	1,249	„
London to Kurrachee	4,823	„

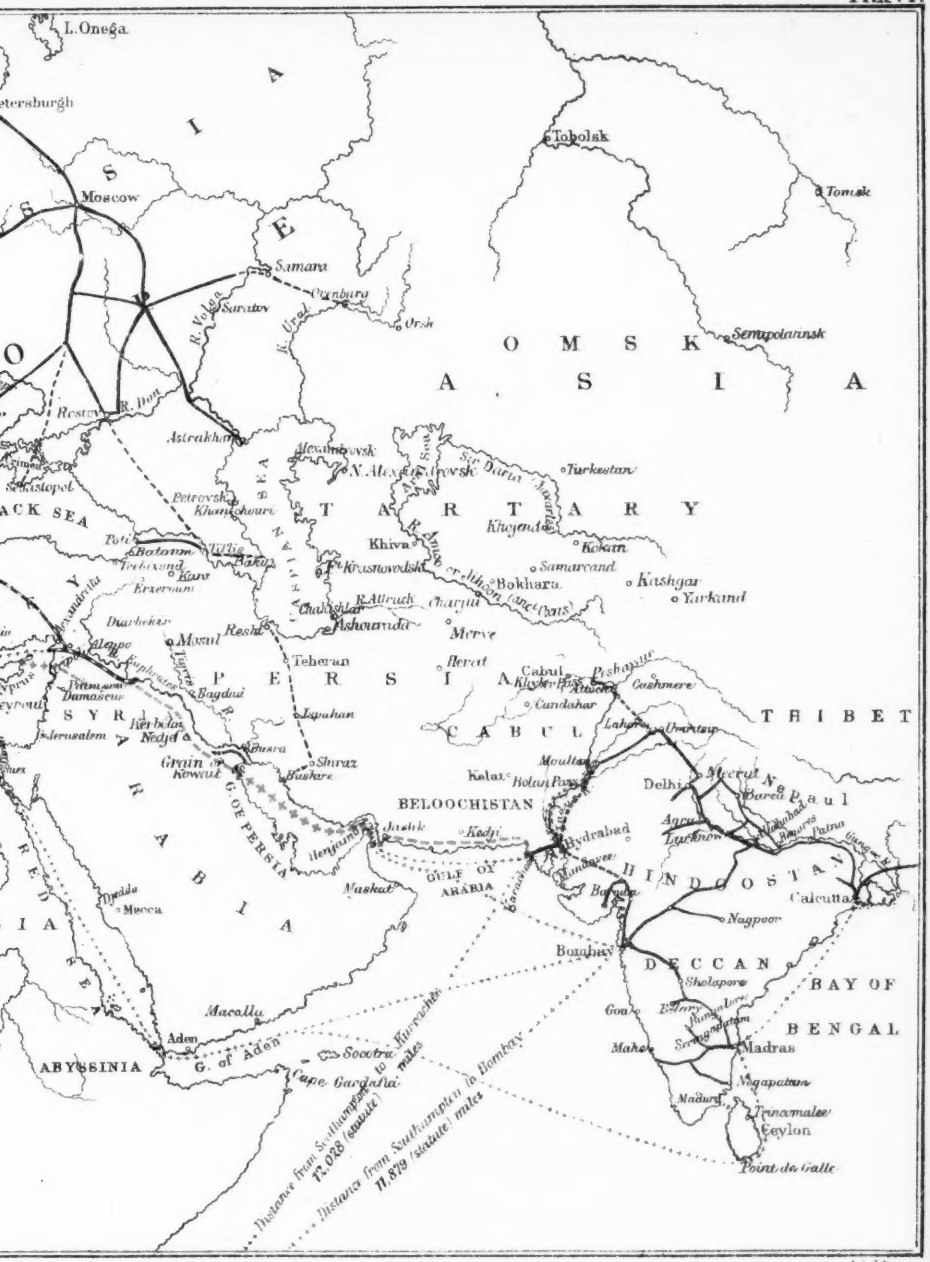
via Brindisi, Suez & Aden

London to Bombay	6,012	„
London to Kurrachee	5,843	„

Saving in Favor of Bombay via Euphrates route 725 Miles
„ „ „ „ Kurrachee „ „ „ 1020 „

Railways completed ——————
Do constructing - - - - - - - -
Do. proposed — — — — —
Route by Steamer ....

Note. *The Proposed Route*


L. Onega
Petersburgh
Moscow
Samara
Orenburg
Saratov
R. Volga
R. Ural
Orsk
Tobolsk
Tomsk
Semipolatinsk
O M S K
A S I A
Rostov
R. Don
Astrakhan
Alexandrovsk
N. Alexandrovsk
Sea of Aral
R. Sir Darya
Turkestan
Sebastopol
Petrovsk
Khamichoura
T A R T A R Y
Khiva
R. Amu
Khojeyli
Kokan
Samarcand
Kashgar
Yarkand
Batoum
Tiflis
Baku
Kars
Erzeroum
Krasnovodsk
Bokhara
R. Attrack
Chardjui
Merve
Chahjuhar
Ashuranda
Diarbekar
Mosul
Reshd
Aleppo
Euphrates
Tigris
Teheran
Heraat
Cabul
Peshawur
Cashmere
Candahar
Damascus
Bagdad
P E R S I A
Jerusalem
Kerbelah
Nedjd
Ispahan
C A B U L
Lahore
Oorniah
T H I B E T
Grain Coast
Kowait
Bussora
Shiraz
Bushire
Moultan
Kelat
Bolan Pass
Delhi
Meerut
Nepaul
Bareli
Allahabad
Benares
Patna
Ganges
Lucknow
Agra
BELOOCHISTAN
Jask
Kedji
Hydrabad
Gulf of Persia
Gulf of Oman
Muskat
Gulf of Arabia
H I N D O S T A N
Calcutta
Nagpoor
Bombay
Mecca
Medina
Macalla
Aden
G. of Aden
Socotra
Cape Guardafui
ABYSSINIA
D E C C A N
Sholapore
Goa
Bay of Bengal
Madras
Mahe
Negapatam
Madura
Tanjore
Tanjore
Tanjore

first-named line indicates our usual overland Indian route *vid* Suez, I pass it by and speak of the other.

In 1868 we had made arrangements for as many as eight lines of communication towards India through the continent of Europe; five were *vid* Turkey, and three *vid* Russia. Of the first, that bearing more directly on Constantinople is through Brussels, Stuttgart, and Vienna, while the next most direct is perhaps by Paris and Munich. The sea passage from the Italian to the Albanian coast is naturally fatal to a continuous overland line through France and Italy. I do not think it would be profitable to discuss which route of these, or which route independent of these, should be selected for an Anglo-Indian locomotive; but the fact that there were ten years ago five acknowledged main lines of telegraph between London and Constantinople, and that these lines might be subdivided into numerous branch and subsidiary lines, may help us to determine how far the completion of present projects to connect the city of the Sultan with the capitals of Western Europe would suit our purpose in providing one grand line of railway communication with British India. The three telegraph lines through Russia may now be looked upon as merged in the Siemens line, which, starting from London, passes through Lowestoft and Emden, Berlin, Warsaw, Odessa, Kertch, and Tabriz to Tehran, where it is taken up by the Government wires, and its messages are transmitted to Bushahr and Karachi. But the chances of a completed railway to Tehran are hardly equal to those of one to Constantinople, and a "concession" would not break ground so freely on the shores of the Caspian as on those of the Mediterranean. As regards Baron de Reuter's proposed line or lines, I am unable to speak of the present state or prospects from any personal acquaintance with details. The silence of the press for so long a period tends to the supposition that the question has been adjourned *sine die*, and probably such is the reality. It is not unlikely that the approaching revisit of the Persian monarch may give rise to renewed talk on the subject, but it would be premature to anticipate the result of a hypothesis.

It may be truly said that a telegraph line is carried over tracts which do not admit so easily the fixation of rails and sleepers or the passage of a locomotive. But, except for protective purposes, posts and wires are not usually brought into difficult places where these can conveniently be avoided—and even where skill, energy, and determination make light of physical obstacles at the onset, it must be remembered that it is not the mere laying down a telegraph line which has to be considered, but also its maintenance and possible repair in after years. Those whose duty it is to keep in order a great work or public building are not always (perhaps it would be more true to say are seldom) imbued with the spirit of the designer or architect; to use a more familiar comparison, the nurse or governess does not care for the child with the affection of the mother. In the case under consideration we must have something which can readily be got at by ordinary guardians, in all weathers, and on all occasions of break or emergency. Therefore, in countries like Persia and Asia Minor, where the mountains are lofty and continuous, and where roads and passes may be

found impracticable to bipeds as to quadrupeds; or, like Mesopotamia and Turkish Arabia, where broad rivers have to be spanned, with much cost and care, and floods avoided or provided against with a skill dependent on local experience, the direction followed by lines of telegraph is important to the due selection of a line of rail. Besides, independently of engineering considerations, there is the same necessity, in both operations contemplated, to deal with the people of the country, whether civilized or half civilized, or sheer robbers and savages. The Bakhtiari of Persia, who will purloin a few yards of wire, or the Kurd of the Turco-Persian frontier, who will make the insulator a mark for his matchlock, may find an object of equal solicitude in the wood and iron of railway contractors, to say nothing of a general love of disorder, and dislike to authorities and regulations.

Not very long ago, M. Ferdinand de Lesseps proposed to take a railway line from Orenburg to Samarkand, and from Samarkand to Peshawar. The distance had been reckoned at some 2,400 miles, and the difficulties to be surmounted will be understood by the fact that the passage of the Hindoo Kush was part of the programme. There was to be—I quote from an article in a daily paper describing the scheme when first made public—"an unbroken iron road, 7,500 miles long, by "which, with express trains travelling at 35 miles per hour, the entire "journey from Calais to the City of Palaces might be accomplished in "eight days."[1] There are many reasons for rejecting or indefinitely postponing consideration of such a project in England. It is very true that the Russian has proved the best land route for our Indian telegraph; but, with telegraph wires, distances are not so important as with railways, and, in the former case, the alternative of a Mediterranean and Red Sea line has been a sufficient guarantee for the preservation of communication, until a through railway arise to supply a new line of telegraph also. I am quite sure that the inventive genius and enterprise of M. de Lesseps could speedily put before us a more tempting proposal than this, and one more likely to carry the popular sympathy and open the pockets of shareholders; but I will speak of it by and by, with others which come into the same category. Looking further back still, I find, more than five years ago—when the distinguished Russian nobleman whose recent movements between London and St. Petersburgh have been so carefully watched and chronicled, was performing the same journey to and fro, with strangely similar intent and under strangely similar circumstances (though in connection with Khaiva rather than Stamboul)—a letter appeared in the *Times*, the subject of which is important to our enquiry. It was then stated that, in the archives of the *Ministre des Voies et Communications* at St. Petersburgh, was a plan which had been provisionally submitted to the Imperial Government, for the construction of a railway commencing at Syd Folden Fjord, in Norway, in 67° 31′ lat. north, and 15° 39′ long. east of Greenwich, passing by Gellivare to Türtüla, Onega, Solikamsk, Kotschaisk, Tobolsk, Irkutsk, Mamatchin, Pekin,

[1] I make it rather nine days; and what would be the condition of troops or individual travellers after nine days and nights uninterrupted journeying at the rate of 840 miles in the twenty-four hours?

Tientsin, to the seaboard in the Gulf of Pe-chili. From Tobolsk a line would run to Pesháwar, which is only some three-quarters of a degree more to the eastward, though very far removed in latitude; whence, to Calcutta and Bombay, respectively, the conveyance of the traveller may be already considered *un fait accompli*, though both lines are carefully particularised in the scheme. The writer of the letter under reference had been for many years Russian Vice-Consul at Shields, and having himself visited a not unimportant part of the route, was able to advance his own opinion that there was no technical hindrance to the execution of the undertaking. I am not aware that any attention was given to his remarkable statement at the time that it appeared, but it was not improbably thought more visionary than practical by the majority of those who perused it. As we are now, however, endeavouring to take in all possible ways and means of communication with India, it may be well to revert to the very words of the Vice-Consul on that occasion. He says:—"Specially constructed steamers will "convey goods and passengers to and from the Norwegian coast and "the United Kingdom. The gravitation system, *per se*, no novelty "and infinitely less costly of construction and working than any other, "is proposed to be applied to this gigantic undertaking, dispensing "with the locomotive or standing engine power, the latter only ex- "ceptionally resorted to. Deep research and the most rigorous "calculation show that the entire import of tea from China, of sugar, "rice, and general produce from the East Indies, &c., can be effected "by the proposed routes much more expeditiously and considerably "under the cost by marine transport *viâ* Suez or the Cape, and "*vice versâ*. European exports will follow this route. Naturally "passengers will prefer land to a lengthened sea conveyance." It may be added that the writer was the reverse of an anti-Russian; he considered that the extension of Russian influence in Asia was all to the advantage of England; he was the strong advocate of an alliance between the two nations, illustrating his arguments by the assertion that Russia supplies us with more cereals than any other country, and that the increase in grain importations to our shores in 1872, and since the later development of Russian railway traffic, was to our incalculable benefit.

About ten days after date of the letter to which I have just referred, the Berlin correspondent of the *Times* extracted from the *Allgemeine Zeitung* the memorandum on an invasion of India which had been presented to the Emperor by General Duhamel at the time of the Crimean War. The details were prefaced by a statement that, according to history, nearly all the conquerors of India came from Central Asia and Persia; that the roads chosen for the purpose by Alexander, Chenghiz, Taimúr, Baber and Nadir were still available or open; and that all these roads, whether from Persia or the Oxus, converged upon Khurasan and Afghanistan. Five lines of march were then designated to Kabul, as follows: 1. From Orenburg, by the Ust-Urt, Khaiva, Marv and Bukhara; 2. From Orsk or Orenburg by Aralsk, Bukhara, Khulm and Bamian; 3. From Orsk or Troitsk, by Aralsk, Ak Masjid, Tashkand, Khokand, Khulm and Bamian: 4. From Astra-

khan by sea to Astrabad, thence by Kadushan[1] or Shamid, Mashhad, Herat and Kandahar; 5. From Julfa on the Russo-Persian frontier by Tabriz, Tehran, Mashhad, Herat and Kandahar. Why the two last should be diverted to Kabul at all is not shown, because from Kandahar there is given the direct route to India by Kwetta, Dadar and Shikarpur; as from Kabul by Jalalabad, Peshawar and Atak (called the best, shortest, and healthiest road); and from Ghazni by Derah Ismáil Khan. I quote this project as indicative of lines of communication useful to be borne in mind, rather than with any intent of provoking discussion on the feasibility of a scheme which, so far as disclosed to the outer world, is almost ludicrously deficient in detail. But it should be observed that the Russian project does not ignore entry into India other than by the Khaibar and Bolan Passes; and there is little doubt but that invaders of India from Alexander to Mahmúd of Ghazni, and again from the ninth century downwards, did make use of other routes for purposes of entrance or exit, or both.

Later still than the reference to General Duhamel's plan of invasion to which I have alluded, a short but significant letter appeared in the *Times* on the subject of roads to India which seems to me to merit particular notice. It called attention to the fact that Persia and Afghanistan are not the only ante-chambers as it were to the Indian palace of attraction; and recalled the circumstance that a Chinese and Tibétan army, fully equipped, crossed the Himalayan mountains into Nepal at the beginning of this century and, after penetrating to the valley of Nawakot, sixteen miles only from Kathmandu, the capital of Nepal, dictated a humiliating treaty to the ruling Gurkhas. The writer then proceeded to show how dangerous to India would be the appearance of an invading force in Nepal, "overhanging, as it does, "500 miles of an open frontier in the very centre of the Gangetic "valley." This Chinese invasion of a country then recently conquered by the Gorkhalis, or, as we call them, Gurkhas, a brave and warlike people, is certainly remarkable; and we know that the latter were utterly defeated. A late history of Nepal, translated into English from the original, mentions the arrival of the large army despatched from China; but asserts that it was cut to pieces by one of their own illustrious commanders, who obtained great glory from the exploit; explaining how "afterwards the Chinese Emperor, thinking it better "to live in friendship with the Gorkhalis, made peace with them."

But this is on a par with Oriental history in general. For instance, in the narrative to which I have just referred, the English war with Nepal, which begun in 1814, and ended about eighteen months later, with the gain to us of a considerable tract of territory, is dismissed in about four lines. We are told that "it broke out in the Terai, but "depriving them (the British) of wisdom, the Raja saved his country. "Then calling the British gentlemen, he made peace with them, and "allowed them to live near Thambahil."[2]

[1] Kabushan: but here probably Kuchan or Shahrud, *i.e.*, the upper or lower road to Mashhad.

[2] History of Nepal, translated from the Parbatiya. Cambridge University Press, 1877.

We have now glanced at a number of routes which, for the traveller starting from England, necessitate an immediate and in some cases a prolonged movement to the east; the more southern course, or descent upon India, being at a comparatively late stage of the journey. It might be enquired into with advantage which of these are the more practicable for the locomotive and the rail; but I think it more profitable in a brief paper of this kind, and especially with imperfect data, to mass them in a general consideration. My own impression is that a railway to India commencing in Norway, with its northern terminus at the Syd Fiord, a grand junction at Tobolsk or Tomsk—roughly assumed as geographically convenient—and a southern terminus at Calcutta, would offer to us in some respects as great advantages as any other; and I believe that, in spite of apparent physical difficulty, a feasible road somewhere in that direction might be discovered or worked out, notwithstanding the Hindu Kush and Himalayas. But we are yet in the dark about even the preliminaries to such an undertaking rightly called "gigantic;" and this is hardly the convenient season for seeking enlightenment. I therefore propose to leave these routes to men who, like M. de Lesseps, if they do hit upon a sound and practicable project, are not likely to abandon it until success crowns their endeavours; and to ask you to think over with me something of which you may have heard before, though not perhaps in minute detail. Instead of the direct and immediate movement from England eastward, I propose to take ship, or ship and railway to Turkey. How Constantinople and the Asiatic shores of the Bosphorus are to be reached will depend upon the result of a great question at this moment under deliberation and agitating the minds of statesmen as well as obscure individuals. Let us suppose ourselves at some particular spot in the Mediterranean always available, and so situated as to place us within easy reach of the Syrian coast, or a convenient starting-point for a railway to the Persian Gulf. As an island wears an independent look, we may choose Cyprus.

I should be very glad to say what I have to say in a few words without being wearisome; but the description of places and statistics are more essential than interesting in a paper like the present. By drawing upon foreign sources, however, as well as English handbooks and English authors, I shall run less risk of repeating facts well known to my hearers, and I venture to hope the published record will be found useful, even if the spoken matter be tedious.

The geographical position of Cyprus would make it a fitting guardian of Upper Syria, Cœle-Syria, and almost of Palestine, if the island were under enlightened Government. We are told that it measures 140 miles in length from east to west, and has an area of 3,000 square miles; that two ranges of mountains stretch respectively along its northern and southern coasts; and that a fertile plain lies between them. It is said to be the Chittim of Scripture, and of the Phenicians as well as of the Hebrews; a name found in the Latin Citium—its chief town in the time of Cimon the Athenian, who died while besieging it in the fifth century before the Christian era. To the classical and mythological age, it was the birthplace of Venus; accord-

ing to Pliny, the seat of nine kings; in ancient history, at one time under Egyptian dominion, then Persian, then Greek, and finally Roman. In more modern days it fell into the hands of the Byzantine Greeks, and afterwards of the Saracens, from whom it was taken by Richard of England during the wars of the Crusades, to be bestowed upon Guy de Lusignan, titulary King of Jerusalem. There were sixteen princes (and one princess) of the Lusignan family, who ruled in Cyprus, on the death of the last of whom, James the Third, the Venetians took possession. The latter again were dispossessed by the Turks under Sultan Selim the Second in 1570–71; and these have held the island ever since, inclusive of a ten years' interval when sovereignty was exercised by Muhammad Ali, Pasha of Egypt. On the east, according to Pliny, it once joined the continent near Syria: to the north the average breadth of the channel which separates it from Asia Minor, once the "Aulōn Cilicius," or Cilician Strait, is probably not 100 miles. The present condition of Cyprus is not hopeful; its population is said to be less than a twelfth part of the number estimated under the Venetians, or some three centuries ago; and the majority are Greeks. Its resources have, it is to be feared, greatly diminished since the Ottoman conquest; and its rich soil remains for the most part untilled and unprofitable; its forests have become less and less rich with trees; and though it can produce silks and cereals, wool, cotton, and other of the more valuable articles of commerce, and keep up an export trade with England and France, Egypt and Turkish ports, a fifth of the island only is said to be under cultivation. As for public works, the roads of the Romans and Venetians have become long since obliterated; the bridges have fallen to pieces, and goods are conveyed in miserable carts, and over almost impracticable tracks. The last Consular Report from Larnaca, dated 31st January, 1877, states:—No public works have been undertaken, and the want of bridges, roads, and jetties is becoming seriously felt. The firman which was read here about the new reforms, soon after the accession of Sultan Murad, remains a dead letter, and but little hope is placed in the working of the Constitution. The local tribunals still refuse to admit Christian evidence in cases in which Mussulmans are concerned. The vexations of the Zaptiehs in the villages for the exaction of taxes have not at all ceased, and little protection is secured to the inhabitants of the rural districts.

Cyprus is, or was recently, divided into four departments, of which three may be specially noted: on the south, Larnaca; on the east, Famagusta; and on the west, Baffa. The seaport bearing the name of the first of these is the ancient Citium: to this may be added Limasol, the great wine centre, a town of 7,000 inhabitants. I have no very full statistics of the port of Larnaca, but fifteen years ago it received 324 vessels of 54,340 tons, and sent out 321 vessels of 53,458 tons. In 1876 there were entered 457, and cleared 483 vessels of 92,926 and 91,690 tons respectively. At Limasol, in 1863, 493 vessels were entered of 32,980 tons.

Famagusta, an offshoot, if not a relic of the memorable Salamis, looks upon the Syrian coast between Latakia and Tripoli, and though

ruined and neglected, might be made, I understand, one of the best ports in the Mediterranean. It was here that the gallant Venetian Bragadino, after a defence famous in history, surrendered to the Turkish commander; and where, tradition has it, the fleet containing the choicest spoil of the island was destroyed by the act of a female captive, who found means to set fire to the vessel, on board of which, she was kept a prisoner.

The superficial extent of the present harbour is reckoned at 32 hectares (nearly 80 acres), to which a depth of 10 metres (about 33 feet or 5½ fathoms), might readily be given; but there is only a space of 2 hectares (nearly 5 acres), which can be relied upon for the actual reception of ships. M. Collas, a French writer, experienced in Turkey and the Turks, thinks that, with ordinary engineering skill, a harbour might be formed here, covering a space of more than 60 hectares (148 acres). The plains of Famagusta and Messanieh, as well as those of Larnaca, are famed for cotton. Water is sufficient in the first. Messanieh can boast an extent of nearly half a million acres, of which perhaps not 100,000 are under cultivation. A little attention to well-irrigation would make it very productive. Baffa is the classical Paphos, celebrated for the worship of Venus, and claiming an origin from the fall of Troy. It is the chief emporium of silk in the island. This trade has, however, greatly deteriorated, and in no way represents its normal or possible condition. So with the cotton, the best and dearest in the Levant. From the 30,000 bales exported under the Venetian Government, there has been a reduction to 3,000. M. Collas thinks that the opening and ameliorating of the port of Famagusta would give an immense impetus to the export of cotton, which might be grown up to the amount of 25 to 30 millions of kilogrammes, or not far short of 30,000 tons, a high figure of productiveness.

The administrative capital Nicosia, or Lefkosia, is in the interior; but notwithstanding its old repute and prosperity under the Venetians, it has become in later years rather a centre of shops than of merchandise: that is, merchants are not resident there; for all trade is carried on through Larnaca. As to Celigne, which M. Collas makes the fourth department of the island, it should be in the north,[1] though the name is not very clearly shown in modern maps. I would add, with respect to this large and beautiful but sadly neglected Cyprus, that, independently of its magnificent position in reference to the Syrian coast, it is rich in natural resources, in agricultural products, and in classical and historical associations. Its name, and interesting particulars regarding its geography and history will be found in innumerable books, from the earliest ages of book-making to the present time. The ponderous old volumes of the 17th century, such as those of Sir Walter Raleigh, of Peter Heulin, and of Purchas have all something to say about it. And it will not be forgotten that St. Paul and St. Barnabas sailed from Seleucia on the Orontes to Cyprus, in the first century of our era.

I do not see that it is exactly talking politics to say that Cyprus in

[1] The Italian "Cerina," ancient Ceryneia, with a small bad harbour.

the hands of Great Britain would be an invaluable acquisition, and worth any amount of land which might be purchased on the coast to its east. The distance to the several ports on the mainland is not great: indeed, the island is said to be visible on a clear day from Seleucia. A railway terminus for the Persian-Gulf-line might be reached in a very few hours, and fair-weather boats calculated to carry over a thousand passengers—troops or civilians—might be used at certain times at an inconsiderable cost. But let us now pause to consider which of the many lines proposed should be chosen for the railway.

Of the routes discussed before the Committee which sat on the Euphrates Valley Railway in 1872, five were selected as the most important, they were:—

1st. A line starting from Alexandretta or Suedia, near the mouth of the Orontes, passing through Aleppo to the Euphrates, at or near Jabah Castle, and thence carried down the right bank of the river to Kuwait, on the western side of the Persian Gulf.

2nd. A line starting from one of the same points, crossing the Euphrates at Belis, passing down the left bank of the river, or the right bank of the Tigris, to a point nearly opposite Baghdad, re-crossing the Euphrates, and proceeding to Kuwait.

3rd. A line starting as before, crossing the Euphrates at Bir, thence going round to Orfah and Diarbekir, and following the right bank of the Tigris as the last.

4th. A similar line, only following the left bank of the Tigris.

5th. A line starting from Tripoli, and proceeding across the desert, by way of Damascus and Palmyra, to the Euphrates, whence it might follow one of the preceding routes.

Since the date of the Committee's report, the late Mr. W. A. Brooks, a member of the Institution of Civil Engineers, proposed a line of railway starting from the island of Ruad, crossing the Orontes near the town of Homs, passing through Palmyra and the confines of the Syrian desert, and finding its way to Kuwait in the Persian Gulf by the right bank of the Euphrates.

It will be observed that here are six projects, but that the first four have the same doubtful starting-point—Alexandretta or Suedia. Of the remaining two, the one begins its course at Tripoli, the other at Ruad, between which places there is a distance of, it may be, half a degree by sea, and something more by land. To me it does not seem material whether we take the one or the other of the six routes, so far as the main object is concerned—or simply to effect railway communication. I believe that, in this respect, the end could be achieved by British energy and engineering in any case. But I do think it important to consider the question of distance; and sanitary precautions are perhaps quite as essential to success as the choice of a line practicable to engineers. The possession of Cyprus would facilitate selection of a terminus; for with such resources as are there available we could only require on the mainland a landing-place, offices, sheds for temporary accommodation of troops, and residence for a small railway staff provided from head-quarters in the island. Without presuming

to set aside the many arguments put forward on behalf of other localities, I at once declare myself in favour of commencing work at Tripoli or Tyre; otherwise of reviving the suggestions of Captain Burton—certainly not the least competent judge among the score and a half of competent witnesses examined by the Select Committee on the Euphrates Valley Railway.

Now, if we are going to run a line through the so-called Syrian desert, we cannot well avoid Palmyra, and here we reach at once a main station in an old acknowledged line of communication between east and west. Whether it was included in the great road passing from Tangiers to India and China I feel uncertain; because the mention of Kufa, between Damascus and Baghdad, as one of the halting-places, leads to the influence of a lower route; but I daresay that it was, and I shall revert to this long line of traffic by and by as having a direct bearing on the subject of present discussion. In any case let us not suppose that in penetrating this resort of Bedouins we have advanced into an unknown region. To the best of my belief I have myself met with more than one European who has accomplished the journey across it when passing from Baghdad to Bairut; and I cannot but wonder that no such experienced traveller was examined before the Select Committee. For about 600 years Palmyra shared more or less with Alexandria the proud distinction of being an acknowledged centre of western traffic with the east. If it be the Tadmor of King Solomon, as generally supposed, it had at the dawn of that period already existed for six and a half centuries. From 331 years before the Christian era, when the Persians succumbed to the Greeks, to A.D. 275, when Zenobia was defeated by Aurelian, Palmyra was a noted city to traders from the Persian Gulf as from the Mediterranean—brought eventually into the Roman commercial system under the Emperors Trajan and Adrian. As it was not, however, a port, it doubtless received its Indian goods through the medium of Arabs. Mr. Priaulx, in his "Travels of Apollonius of Tyana," speaks of it as "pre-eminently an inland town," and "situated in the desert "some eighty miles from the Euphrates." He does not think that it could have had any direct intercourse with India:—"Its citizens "and resident strangers were merchants, warehousemen, carriers, "agents, but they assuredly were not seafaring men; they possessed "no ships, and received the produce of India through the Arabs, "whose vessels delivered it at Sura or Thapsacus on the Eu-"phrates, whence it was brought on camels to Palmyra." The two cities named appear to me to represent, one a point high on the river near Mr. Andrew's Jabah Castle or Belis, and the other a point low down towards the site of ancient Babylon. But Mr. Priaulx also says that, if the Arab or other vessels bringing the produce of India up the Persian Gulf did not themselves ascend the Euphrates, "at Teredon they discharged their cargoes intended for "Vologesia, which was reached either by land on camels, or in "vessels of lighter draught by the river." The time taken up in the journey he is unable to conjecture; but he puts the distance at nearly 250 miles. "At Vologesia," he writes, "a two days' journey from their

"city, the merchants of Palmyra took up the trade. In its market or "fair, held always at some little distance from the town itself, they "met the Arab and Indian traders, and exchanged with them by sale "and purchase the manufactures of the west for the goods and pro- "duce of India." Now in "Peter Heulin," an edition of 1652, I find that Balsora (our Basrah), the port town to Babylon, is supposed to be the city of Teredon, mentioned by Ptolemy; and that Vologesia is placed by Ptolemy among the cities of Chaldea, but by Marcellinus in Assyria. Kiepert's "Imperium Romanum" map shows it to be in the former locality and near Babylon; but by the two days' distance from Palmyra, Mr. Priaulx must evidently suppose it higher up the river. It has been a learned question whether certain ambassadors coming from India to Augustus passed through Palmyra; and the argument used against the likelihood of the route was the statement that owing to the length of the journey several of the dignitaries died on the road —a circumstance which was hardly credible for so short a journey, and so direct a route.

Captain Burton gives the direction and distance of two routes to Palmyra from his own knowledge; that is to say from his own knowledge, inasmuch as he had been to Palmyra—though he was not asked the important question by what route he had gone or returned. Than this renowned city no place seems more fitting to be a station on the line of railway from the Mediterranean to the Persian Gulf. It is only 144 direct geographical miles from Tyre, or 158 from Tripoli, and "is in the first overland route which was "made to the Euphrates; it is as old as the days of David and "Solomon."[1]

Perhaps the main objection to Captain Burton's proposal in favour of Tripoli is contained in the answer of Captain Felix Jones to the questions put to him in a second recall before the Committee. "Tripoli," "he states, "is no port, and is as hot and unsalubrious as Alexan- "dretta itself. Secondly, between it and Palmyra the double ranges "of mountains, Lebanon and anti-Lebanon, offer obstacles no less for- "midable to surmount with rails than the passage of the Bolan Pass; "thirdly, the route is both indirect and more distant from all *points* "*d'appui;* it is more in the true desert, and therefore more liable to "greater risks."[2] But the risks are afterwards explained away as comparative, and the climate of Alexandretta is admitted to be "a little more "unhealthy than the others." Whereas, on the physical difficulties of the Lebanon and Anti-Lebanon, I turn to the pamphlet which Mr. Brooks published under the title of "Euphrates: the Road "to the East." This gentleman says, "The line of railway proposed "by me from the Syrian shore, abreast of the island of Aradus (Ruad) "to the Bay of Kuwait in the Persian Gulf, will have a length of only "850 miles, and will certainly be 100 miles shorter than from any other "proposed western port except that of Tripoli;" regarding which, he adds, a few pages further on: "Though I might damage this rival "scheme by referring, as others have done, solely to the great altitude

[1] Parliamentary Report on Euphrates Valley Railway, pp. 130–135.
[2] *Ibid.*, p. 151.

"of the Lebanon range in the neighbourhood, I think it fairer to "at once acknowledge that, although at a greater cost, the same pass "through the mountains, which I have availed myself of for the road "from Aradus, is apparently also quite accessible from Tripoli, and, "therefore Aradus and Tripoli stand upon their own competitive "advantages as harbour or naval stations." The pass mentioned is that called *Wádi Khálid*, and it seems to me therefore that if a landing-place were available between Aradus and Tripoli, that would be the best and most convenient point for a railway terminus. Famagusta would be the opposite port in the island of Cyprus, although Larnaca, if preferred, would doubtless answer equally well as regards geographical position. If there be no intermediate spot suitable to the purpose, then let those acquainted with the localities choose between Ruad and Tripoli; but there would be no need of preparation at either for the shelter of line-of-battle ships, as readily provided by the natural advantages of Ruad.

I shall presently have to make one short quotation from the Report of the Select Committee to show the favourable opinion entertained of the Euphrates Valley Railway in respect of British interests. It is perhaps only fair to repeat the passages by which that opinion is immediately preceded:—

"The principal argument in favour of Alexandretta is, that it "possesses a fine natural harbour. The objections taken to it are— "first, that it is an unhealthy place; and, secondly, that a railway "starting from it would have to be carried across more difficult country "than would be encountered on a line from Suedia up the valley of "the Orontes. Suedia, it is said, is far more healthy than Alexan- "dretta; but, on the other hand, there is no port there, and should it "be chosen as the terminus, great expense must be incurred in making "one. The advocates of Alexandretta contend that its unhealthiness, "even at present, is much exaggerated; and, further, that a much less "expenditure than would be required to make a port of Suedia would "be sufficient to drain the marshes, which are the principal cause of "the insalubrity of Alexandretta. It has also been shown by recent "engineering evidence that there would be no difficulty which could "not be readily overcome in the line between Alexandretta and Aleppo, "and that it would be even preferable to the line of the Orontes. Your "Committee have not the means of forming a decided judgment on "these controverted points, and are of opinion that should a railway be "undertaken, it would be desirable that the relative advantages of "these two Mediterranean termini should be carefully investigated by "a competent commission.

"With regard to the third port which has been mentioned, namely, "Tripoli, your Committee would refer to the evidence given in its "favour by Captain Burton, which is not, however, supported by that "of the other witnesses whom they have examined. So far as the "information they have obtained goes, they are disposed to prefer "Alexandretta to Tripoli as the point of departure, even for a line "down the right bank of the Euphrates; while, should a line down "the Tigris be preferred, or should it be thought desirable to connect

"the new line with the projected Turkish system, there can be no "doubt of the superiority of the former terminus.

"As regards the terminus on the Persian Gulf, your Committee "are decidedly of opinion that it would be better to carry the line to "some point where it might be brought into communication with the "steam vessels which are now under Government subvention to carry "the mails, and which ply from the Indian ports to Bussorah, than to "continue it along the coast to Kurrachee, by a very expensive and "probably unremunerative route. Of the particular ports which "have been mentioned, they are inclined to prefer the port of Grane; "but upon this point, as well as upon the selection of a port on the "Mediterranean, they think that a local inquiry, conducted by com-"petent scientific authorities, with a special reference to the purpose "in view, would be desirable.

"Passing from the question of the termini to that of the route "itself, your Committee find that the arguments in favour of, and "against, the Euphrates and the Tigris routes respectively, may be "thus stated:—

"The Euphrates route is considerably the shorter, would be the "cheaper to make; and, assuming an equal rate of speed, would "afford the quicker passage for persons, troops, or mails passing "between England and India. The Tigris route might attract the "larger amount of traffic, and would connect itself better with the "projected Turkish system."

It will be observed that in selecting Tripoli for the point of departure, I am only differing from the Committee in a *disposition* to prefer Alexandretta, so far as the information they had obtained enabled them then to form an opinion. In carrying on this preliminary line to Kuwait, I am strictly following the course they were inclined to prefer; and in pronouncing in favour of the Euphrates route, I am advocating that which they have stated to be the shorter, cheaper, and more expeditious. Mr. Brooks has strengthened the case in favour of Tripoli, by the additional evidence of his pamphlet, published since the sitting of the Select Committee, because his proposal to select Ruad as a railway terminus on the shores of the Mediterranean, is tantamount to an approval of the desert line from Tripoli.

Fully persuaded then that there is no valid objection, moral or physical, to the construction of a line of railway through the Palmyra desert to a convenient point on the Euphrates, and thence to the Persian Gulf; and believing that the said line has been sufficiently studied in practice to make the only material subject of deliberation its Mediterranean terminus, I will put as a not absurd hypothesis, that we inaugurate our operations for urgent overland communication with India by establishing a depôt, for men and materials both, at the island of Cyprus. This done, we commence work simultaneously for an eastward as for a westward line; the first, whether at Ruad or Tripoli, or other point easily reached from Famagusta or Larnaca, to be continued for 850 miles to Kuwait, on the Persian Gulf; the second, at Karachi, to be carried along the Makran coast to Jashk, or a more convenient spot in the vicinity—roughly 500 miles by map measure-

ment, but nearer 700 by the telegraph route. These two completed, there would only remain the distance from Kuwait to Jashk, for which specially organized transports might be requisite. I do not consider it romancing to say that the voyage from Cyprus to Karachi might in this way be accomplished within a week, allowing a day and a half for embarkation and disembarkation. For instance let us reckon :—

Ruad or Tripoli, to Kuwait, 850 miles at 25 miles an hour, say	36 hours
Kuwait to Jashk, 600 miles by steamer, say	60 ,,
Jashk to Karachi, 700 miles at 25 miles an hour	30 ,,
	126 ,,
Allowed for delays	30 ,,
	156 ,,

or six days and a half.

Now I know that it may be said, "Why disembark troops at all at "Jashk, whence the sea distance to Karachi would enable them to reach "that port in twenty-four hours later than by train; or only twelve hours, "allowing for delay in disembarkation?" To this I reply that twelve hours is an important gain in time, when the occasion is an emergency; and that the delays in disembarkation would in some way be counterbalanced by the lesser inconvenience of getting men and baggage from trains to barracks than from transports in the harbour. And I further reply that the whole arrangement is only proposed as a primary step; because the two sections of railway I advocate as an urgent measure, to be accomplished as early as practicable, are really but parts of a grand whole line of communication which *must* at some future period be made to connect east and west. The point at which the Euphrates is touched from Palmyra should eventually be a junction for lines from Scutari; and who can say how many other quarters; and again between that point and Kuwait, a line should strike off to the eastward, which, passing through Persia, should join the Perso-Baluch line at Jashk or in the vicinity.

Of such a line it had been my intention to have traced out the actual course; but I fail, or at all events withhold a plan, from want of fuller data on the Kurdistan passes; and it seem to me that the through line must be a remote even though a sure achievement. Any line leading to Ispahan would have an immense advantage in the fact that from that city eastward all is plain sailing up to the mountains below Karman; whence my impression is, from more than one journey in the neighbouring districts, that there would be no great difficulties in selecting a means of passage to the Makran coast. But Ispahan is far north; and Baghdad, Shustar, Shiraz, and Lar, seem to indicate a more direct communication with Karachi, and therefore a fitter supplement to the Euphrates Valley rails. Were it not for the comparative unprofitableness of the northern shores of the Persian Gulf, I should advocate the actual coast line as others have done before me;

but there is just enough indecision on the subject to render advisable a pause which might result in bringing into the system an important town such as Shiraz, and penetrating the tracts between that place and Bandar Abbas by a more direct and shorter route than that of the sea coast. Mr. Gifford Palgrave tells the Committee that he has "landed at every little port, or possible place, along the whole length "of that coast from Jashk to Bushire;" that "it is thinly peopled "but by no means desolate, or destitute of inhabitants; is well sup- "plied with water;" and that "the mountains which line it, although "not far from the sea, yet in hardly any case come down actually upon "the sea, but leave a plain of various breadths, sometimes as much as "twenty miles, sometimes less, which plain is perfectly well inhabited "and well supplied with everything necessary to life."[1]

Captain Felix Jones, on the other hand, does not consider Mr. Palgrave's view the right one, because his subject is clearly not regarded with the practical eye of a surveyor, but after the manner of a passing traveller without practical knowledge. He admits, however, that a railway along the coast might develop the traffic to a small extent, and he says nothing of physical difficulty. The question, however, is one for a further Commission to investigate and decide. In the meanwhile I see in Mr. Ainsworth's map of 1872, which illustrates the "proposed railway routes in Western Asia," and in Mr. Dawes' scheme for utilizing the River Kárun, matter for very serious consideration. In connection with the latter, Mr. Mackenzie's account of the road from Shustar to Ispahan is a useful paper, although the conclusion at which he arrives, that the said road would not be found "so difficult "or expensive for a railway as either that from Resht to Tehran, or "Bushire to Shiraz" is not thoroughly cheering. For the country between Resht and Tehran, and especially Bushahr and Shiraz, is one of mountains, passes, and ravines; of high tracts not to be attained, and of low tracts to be sedulously avoided. The main feature of the present argument is, however, that a comparatively direct line from the Mediterranean to India is feasible; and that once having spanned the Palmyra desert, and descended the Euphrates, the nearer we keep it to the sea coast the better for our general and regardless-of-expense purpose. I spoke of an old line of traffic from Tangiers to China: that line passed from the Euphrates to Basrah, Ahwaz, Fars, Karman, and Sind, on its almost interminable way. I am inclined to think that, in Baluchistan, it took the old road of Minab, the Fanoch Pass, Binth, Gaih, and Kej to Baila.

Many of the places to which I have referred I know from personal experience. Jashk is one. It was a dreary spot when first contemplated as a telegraph station in 1862, and actually selected for the purpose in 1868; but it has of late years improved. Lieutenant Stiffe, Indian Navy, in his "Supplement to the Persian Gulf Pilot," published by order of the Lords Commissioners of the Admiralty, says:—

"Jashk Bay was the rendezvous of the English ships trading to

[1] Minutes of Evidence taken before Select Committee on Euphrates Valley Railway, p. 21.

"Persia before the Portuguese were dispossessed of Hormuz. . . .
"A small village has sprung up since the establishment of the telegraph
"station, and a few supplies can be got, such as sheep, fowls, a few
"vegetables, and various articles used by Europeans, but not in large
"quantities. . . . There is a little rocky point in Jashk Bay, . . .
"where there is a good landing, only a quarter of a mile north of the
"telegraph office. . . . The anchorage in Jashk East Bay is good
"during a *shamal;* but in a winter easterly gale it would be quite
"exposed. . . . A convenient anchorage for a vessel, not drawing
"more than 15 or 16 feet, is half a mile off shore. . . . A large
"vessel must anchor north-north-west. . . . A sailing vessel in
"December and March should be able to weigh, and moor round the
"point, if a heavy north-wester set in, of which she could get warning
"by telegraph from Henjam."

Here I should explain that Henjam is an island, of about 5 miles in length and $2\frac{1}{2}$ broad, about 120 miles north-west of Jashk, and immediately south of the large island of Kishm, from which the channel which separates it is in one place only a mile broad, well situated as a rendezvous for vessels passing up and down the Persian Gulf; it was made one of our telegraph stations in 1869, when the cable was transferred to the Persian shores of the Gulf from the opposite coast at Ras Masandom. There is good shelter for ships there; and the place has certain advantages over Bassadore (or more properly Bassiduh), the old coaling station so familiar to the Indian Navy.

Though not entirely agreeing in the views put forward by the promoters of the old Euphrates Valley Railway project, I think that the reasoning was in the main sound, and the arguments brought forward enough to convince Government, as they did the Select Committee, that "if the enterprise were to be regarded simply as one affecting "British interests, it would be the wisest course to adopt the shortest "and most direct line not open to very obvious objections, and that "one of the two routes by the way of the Euphrates should be pre-"ferred." And now I may venture to touch upon the practical uses of the line already stated, but more than ever demonstrated by the occurrences of the last few years—otherwise of the interval between the last deputation on Mr. Andrew's proposal and the present time.

It was, perhaps, rash on my part to give a title to this paper so comprehensive as to include a state of things which might, almost equally and at the same time, affect two lines of Anglo-Indian communication so close together as those of the Euphrates Valley and Suez Canal. But this is really the great contingency of all, and unfortunately "possible." The long sea route is a very long one, whether we take into consideration the Isthmus of Panama with the Malay Straits, or restore to the Cape of Good Hope its old undivided glory. There, however, they are; and, though I commenced proceedings by putting them aside and am not going to dwell upon them now, I cannot but acknowledge their presence and "possible" uses, and feel thankful that we possess them as a *dernier ressort.* But let us, for an instant, look into these possible "contingencies" that would shut up both the Euphrates route and Suez Canal.

In the evidence before the Select Committee in 1872, I observe questions put to Captain Tyler as to the probable result of a Russo-Egyptian and Russo-Persian combination against us, the former on the Suez and the latter on the Euphrates Valley lines of communication. The reply is that "if Russia and Persia were to combine, then "the Euphrates Valley would be more exposed; if Russia and Egypt "were to combine, then the Suez route would be more exposed." I see a more dangerous combination than either, which might affect both routes simultaneously, that is, a Russo-Turkish one. Hence the necessity of striking while the iron is hot, or immediately securing a line by Treaty with the Sultan, which should be, to all intents and purposes, British; protected by a material force on the coast—not a ship or two, with a guard of marines, but an island, with garrison as well as depôt—and the eastern terminus of which could be reached in 90 hours from India, but in much less time from the entrance to the Persian Gulf. The shortness and directness of this line, constructed with English money, would be the truest guarantee of its intent and purpose—that it is, in fact, a mere link with India—and its original unprofitableness, in a money point of view, should prove that it is not designed to draw out the riches of the country, and direct them to the benefit of aliens. Eventually, if its example caused the formation of branch native lines, and such junction produced a golden harvest for parties concerned, the profit to England would have been legitimately acquired. I should be very glad to think a practical notion of this kind could find place among the minor considerations of the great Congress now sitting. For, if peace follow the present negotiations, which is at least probable, my humble opinion is that no time should be lost in carrying out some such end as that contemplated in the provision of a railway, which I rather call "Palmyrene" than "Euphrates Valley," whether its existence be provided for by payment, or in compensation for claims, or as part of an Anglo-Ottoman scheme of mutual benefit. If peace be lasting—a consummation devoutly to be wished—then would the establishment of the railway inevitably tend to the civilization and material good of a region too long neglected, and second to none on the face of the earth in interesting associations.

Supposing it were not Russia, but another chance ally of Turkey or Egypt, or of both together, which threatened our communication by Suez or Palmyra, and that the chapter of accidents contained an account of our failure to counteract the hostile combination. In such case we should have played our cards very badly to be shut out from the vast field of proposed communication with India, to which I have already adverted in describing the several northern projects. For I am fully convinced that some years hence, if none of these sketched-out lines actually join our Indian system, there will be no very long link left to complete, in at least one or two of the number.

I must apologize for putting before you a paper which want of time has compelled me to complete in a form less methodical than the importance of the subject demands. Those present who are agreed with me in the propriety of giving attention to an alternative Indian line to

that through Egypt, will greatly aid the cause advocated, by making practical suggestions on the description of carriage and railway gauge, and in the steam transports which appear most suitable to meet the requirements contemplated.

Mr. W. Gifford Palgrave: Speaking with all possible deference to the practised authority whose paper we have just heard, and in whose views I have the pleasure of entirely and thoroughly concurring, as far as the importance of the line is concerned, and as far as the advisability of making Cyprus, in a certain measure, the starting point of that line, I have only noticed one slight point in which I would venture to differ, as far as my personal experience of those countries goes, from Sir Frederic Goldsmid's case, namely, from the exact starting of the line from either Tripoli or Tyre, and conducting it through Palmyra. I myself visited Palmyra about the year 1861, and I went to it from the town of Hamah, which is about two days' horse-journey south of Aleppo, and I came back by the town of Homs, which lies somewhat further to the south. To both those places—Homs and Hamah—the starting point would not be from Beyrout or Tripoli itself, where the line of the Lebanon and Anti-Lebanon might be turned, and which would necessitate a great circle of route, but rather from the island of Ruad. Unfortunately, there does not appear to be any decent anchorage or any sufficiently sheltered place where vessels of any considerable size for transport could be made use of at that particular point of the coast. I have visited the island of Ruad. I went from Tripoli, and I think, on horseback, it took me fourteen or fifteen hours to get opposite to the island of Ruad, which was in sight of the shore. I do not remember having observed that there was any available point for an extensive landing point in that part. I think in that history will confirm me, as it makes no mention of that island ever having been used as a shelter or harbour for any anchorage. However, that would be the point to reach Palmyra. But I venture to hold the opinion which I gave several years ago, when I had the honour of being called before the Select Committee in 1872, that the proper landing point, and the one most in agreement with the proposed idea of Cyprus, would be Eskenderoon or Alexandretta. The first reason is that there would be a good harbour, which, with very little trouble, could be made into an excellent one, and possess the additional advantage of being unique, because it is well known that Jaffa is a wretched roadstead and Beyrout is not much better. The objection to it as a landing point is its unhealthiness. I admit that down on the coast, and where there is a large trading station which bears the name of Alexandra, there is a great deal of marshy intermittent fever; but I know, from residence there, that houses are placed on a little range of hills at a height of from 1,500 to 1,600 feet above the sea. This harbour of Eskenderoon resembles the harbour of Kingston, Jamaica, where the troops were: there was an amount of yellow fever, and so on, everywhere; whereas, on the contrary, when the station has been removed to the neighbouring camps of Up-Park and Newcastle, close to the harbour itself, the troops were as healthy as they could be in any station in England; consequently, I think the objection of the unhealthiness of Eskenderoon arises from the total want of attention on the part of the Government that at present occupies that part, to its present sanitary conditions. With very little difficulty a perfectly healthy spot might be selected, namely, at the hills of Beyland, immediately behind Eskenderoon, where, at a distance of an hour and a half from the landing place, the troops could be quartered in the most healthy manner possible, alongside the line, and be able to make use of it immediately. Secondly, the communications from Alexandretta and Eskenderoon to the Euphrates Valley are the best; all of them are those that are most used by the inhabitants of the country at the present day. It is observable, with reference to Palmyra, that the communications are very difficult indeed, not on account of the Arab or Bedouin tribes with whom, as Sir Frederic Goldsmid remarks, there would be no difficulty to make an arrangement; but from the want of water between the last station on the Syrian side and Palmyra, a distance of sixteen hours on horseback, there is not a drop of water at hand, and you are obliged to carry it with you. Starting from the other side of Palmyra the same difficulty exists. Water is found only in scarce

quantities and at great distances, and I do not think artesian wells could remedy that in time. The favourite route at the present moment, and which, according to Eastern history, has been the route ever since the breaking up of the Ottoman Empire, is that which, passing from Eskenderoon, passes over the Beilan Pass to Aleppo at a very small height. I have been over the line on horseback, and in no point has the line I believe to pass over a height of about 1,200 feet above the sea. It would reach from Aleppo through the pass down to Rakkah upon the Euphrates a little to the north-east of Palmyra or Tadmor, and then follow the line of the Euphrates. When we talk of conveying any large number of men for considerable distances, it might be under circumstances when there was very great heat, and a copious supply of water along the route is an important matter in order to contribute not only to the comfort but to the safety and the life of the troops, who would fare as badly as the unfortunate ambassadors mentioned by Sir Frederic, many of whom it seems died on the way. Therefore from these two motives, namely, that of a good starting point—and, I venture to say, a perfectly healthy starting point with very slight precautions—with the advantage of water along the whole route and with no engineering difficulties on the way such as high and difficult ranges, of course I would recommend the route from Eskenderoon by Aleppo down to Rakkah, and so along the line of the Euphrates, and from Rakkah southward. This would very nearly coincide with the Palmyra route. From observation I should say that that line would exceed the other line in length about 100 miles. On the other hand it would shorten the distance in this way, that Eskenderoon is much nearer to Cyprus than Ruad, and although the land route would be lengthened about 100 miles, the sea route would be shortened about forty or fifty; so, setting the one against the other, it is really, in so great a distance, hardly a point of importance. On that only point do I venture to differ from the very able lecture we have heard delivered. There is one point I would notice with regard to the northern coast of the Persian Gulf. That coast I did rather against my will in a small boat, touching the coast at every point; and I still maintain what I before stated, that as far as the engineering difficulties are concerned there are absolutely none. In taking a line from Bushire right as far as Jashk, the high promontory belongs to the other side. On the Persian side there is a range of mountains beginning south of Bunder Abbas and rising in height to the east. The spurs which come down to the sea coast, if any, are extremely small; at the same time I also concur with Sir Frederic Goldsmid in thinking for the moment that sea conveyance would be the most desirable. I would add one point about the harbour of Koweyt, which I visited and which is far to be preferred when the scheme comes up for consideration. It is certainly the most desirable. The population of that part of Arabia are, without exception, what we should call the most civilised of any whom I have come across. It has a very good harbour, and the population are the most civilised I have come across in the way of understanding the advantages of commerce and navigation, and consequently a certain amount of local assistance might be expected from them. From there would be a good starting point to beyond Jashk as far as I can judge from my own experience and the experience of others.

Mr. HADDAN, C.E.: I was late Engineer-in-Chief to the Turkish Government. The province which I had under my charge for eight years was bounded on the north by Aleppo and on the south by Jerusalem; and I think I can therefore give you a little information on the subject of the Overland Railway to India. I am sure you all will agree with me that Sir F. Goldsmid's suggestion of the Island of Cyprus, as an outpost, is a golden one, for you will see that it is quite as easy to get to it by water as it is to Constantinople, the proposed terminus of the Austrian State Railway; or rather, I should say, it is quite as near, and decidedly much easier. The line from Vienna to Constantinople would have to pass through Bosnia, in which country there is not a flat ten-acre field to be found; so that I think the question of a through European line may for some ten or twelve years be decidedly thrown on one side, and Constantinople be ignored. The only chance, therefore, we have in our time of getting to India by rail is decidedly from the Mediterranean. With all due deference to Mr. Palgrave, I may mention that the Beilan Pass is so close to Alexandretta that you cannot climb it by an ordinary railway. It is 2,200 feet above the sea-level, and at a distance of only 14 miles from the coast the gradients for a

railway would be 1 in 12, so that it would be another failure like the Mont Cenis, and without the ready-made road either. The question of the insalubrity of Alexandretta has been much exaggerated. During my period of office there I was instructed to drain the marshes. The whole thing could be done for 3,000*l.*, which is a mere bagatelle. My plans were published in the Blue Book on the Euphrates Valley Railway. In fact, it is not a marsh at all, the bottom being sand; but the sea, beating into the bay, has formed a sand ridge all along the littoral, which prevents the fresh water escaping into the sea; moss and all sorts of vegetation has sprung up, and the fresh water not being allowed to run off, a very undesirable smell arises from the putrefaction of the moisture. All along the coast from Alexandretta to Suez, there is no port or harbour at all, except Alexandretta. The apology for a quay is situated close to the town, and on the east side of Alexandretta Bay; but there is a fine natural harbour on the left-hand side of the bay, at Ayas. Starting from Ayas, after the Plain of Issus is traversed, you can commence to rise many miles sooner than when starting from Alexandretta itself; you may thus get over the Beilan Pass, and you also settle the question of insalubrity. The port of Seleucia or Suedia has been suggested, because there is no pass to get over, but there is no harbour, and the river has to be crossed seventeen times in running up the valley. And, moreover, between Seleucia and Alexandretta there is a famous point which is called Ras-el-Hanzir or the "Pig's Head," which is quite impassable even for foot passengers; so that it would be impossible to join this line to Europe. This is one of the main arguments in favour of Alexandretta as against Suedia, Tripoli, Tyre, and all the southern ports, and is the reason why the preference is given to Alexandretta in a commercial point of view. But I fancy Sir F. Goldsmid was not proposing the Palmyrene trace as a commercial speculation but merely a military line, and there is no objection, provided arrangements be made to join the European main line route at Aleppo, or some point even further inland, say Mardin. If we study all the Lebanon passes from Alexandretta south, you will find (1) Suedia, the outlet of the Orontes; (2) Tripoli, which is only 700 feet high; (3) Tyre, which is the natural outlet of the country, there being no pass since the Leontes debouches there. Beyrout is out of the question, as the road to Damascus passes the Lebanon range at over 3,000 feet elevation: it might have been turned, however, *viâ* Sidon. The learned lecturer referred to Baron Reuter's expedition to Teheran. The Shah of Persia was most anxious to have the work done under his own eye, and as he would not trouble to go to the Caspian end of the line, he insisted on the line being commenced at Teheran. The cost of the rails, owing to transport difficulties, I was informed by the engineer in charge of the line, reached such a point that they might have been made in silver on the spot. With reference to the Suez Canal, I saw a letter in the *Times* a week ago, signed by MacKillop Pasha, in which he states that he has provided such powerful dredging machines in the event of a steamer or vessel being sunk in the Canal, that he could cut a fresh channel in a week. There is one very bad place I may mention, near Ismaila, where such an operation would be out of the question: it is a rock cutting—the Suez Canal is not all sand, by any means. This cutting is something like 70 feet deep, and it is, in addition, situated on a very sharp curve. Now, if any political accident happened to a vessel in the Suez Canal, it is quite certain that it would occur at this point; so that the route to India by the Suez Canal might be perfectly blocked at any moment and in the simplest manner possible. The Egyptian Railway would not mend the matter, for there would be no reserve shipping at Suez. You may wonder why one could not make a line from Alexandretta to Meskineh, a town near Aleppo on the Euphrates, and thence adopt river transport. It is only about ten hours from Aleppo, or 180 miles from Alexandretta; but the Euphrates, as also the Tigris, are very tortuous and sluggish, and full of shoals. The height of the river at Meskineh is only 600 feet above the Persian Gulf, so the fall is not enough to cut a straight channel, and the consequent detours are so overwhelming that after hours you will come back almost to the spot where you started from. There are also weirs erected all along the river for irrigation purposes, the cost of buying up which precludes all idea of making the river navigable. Midhat Pasha, my chief, cut openings through the weirs and made them into rapids. It nevertheless took nineteen days to get from Baghdad to Meskineh. We had to stop at night and also frequently in the day

to cut fuel, &c., and in bad places we ran into sandbanks every five minutes. These seem trifles now when you are not in their midst, but on such an important route, such tedious and irksome delays would be fatal. The city of Aleppo is about 1,100 feet above the level of the sea, and the line from Alexandretta, viz., Aleppo to the Euphrates, has nothing more to recommend it over the Palmyrene line except that most important point Mr. Palgrave mentioned to you, viz., the question of water, which is a most important one; but for a strategical line I believe Captain Burton's proposed line from Tyre is the most feasible. It has been surveyed by the Turkish Government, and water borings were attended in every case with success. The importance of this matter with reference to the road to India has not, I may mention, been overlooked by Russia. Seven years ago they appointed a Consul to Aleppo, whom I knew intimately; and, without breaking confidence in any way, I may mention that this gentleman's whole business was to find out all he could about the Euphrates Valley Railway, and to place every possible obstacle in the way of its realisation. The English Consul at Aleppo mentions an obstacle to railway construction in those countries which, until I designed the Pioneer Railway some ten years ago, I myself found an insuperable one, and that is the question of labour. If you are going to make a railway of something like a thousand miles long, where are you to find the arms and the legs to make it with? In an agricultural country, especially after a war or famine, every man is better employed tilling the ground than in making unprofitable earthworks. In addition, a country like Turkey, where nearly the whole of the revenue is derived from agriculture, would certainly—the Consul thinks—be ruined during the six or seven years; the bone and sinew of the Empire were doing the English Government's work instead of their own. I have studied this difficulty as an engineer, and have succeeded in devising a system of railway which has no earthworks. It was described *in extenso* in this hall some ten days since, and can be executed at the rate of six miles a day with only 100 workmen per mile (foreigners). Being constructed entire in the workshop, its progress is unlimited, so that it could be laid down, not only from Alexandretta to the Persian Gulf, but, if you like, all the way to India in less than two years' time; and not require some twenty or thirty years before a steam communication could be accomplished in the usual manner. The Peninsular and Oriental mail subvention would suffice to guarantee the dividend of the "Pioneer," which, after supplying reliable statistics of traffic, &c., would make way for its successor, greatly aid its construction, and then be broken up into branches to feed the main line.

Lieutenant-General Sir ARNOLD KEMBALL: I think that if the intention, regardless of expense, were merely to connect the Mediterranean with the Persian Gulf, there would be no objection to the line proposed by General Goldsmid save in the physical obstructions pointed out by Mr. Palgrave; but the main objection is that it would not pay. Commercially it could not supersede the Suez Canal as a highway for ships from sea to sea without breaking bulk; and in the event of a Russo-Egyptian or Russo-Turkish combination Englishmen should more properly direct their attention to maintain their communications through Egypt and secure their position there, than to protect a railway extending for a thousand miles over a waterless desert through an enemy's country. For the transport of troops I believe that the necessity for repeated transshipment would render the gain in time very insignificant, and would bar the use of this line as a commercial highway. Moreover, if we were involved in a conflict with Russia on account of Turkey, this line would lie out of the region of strategical operations in that country.

My contention is that both for military and commercial purposes a grand trunk line from Constantinople to the Persian Gulf, with a branch from Alexandretta to Mosul or thereabouts, would be more advantageous to our interests; it would attract the traffic of the country through which it passed, and probably be remunerative over every section, whereas the proposed line would be devoid of any local traffic, and would merely furnish a means of communication between the Mediterranean and the Persian Gulf *en route* to India, much inferior, in my opinion, to that already existing through Egypt. Even as a means of direct communication from sea to sea, I should still prefer a line from Alexandretta to the Tigris, and thence *vid* Baghdad to the Persian Gulf.

Koweyt possesses many advantages as the terminus of such a line, but it could

be hardly included in the larger railway scheme to India, as involving a *détour* from that port round the head of the Persian Gulf to meet the proposed line from Kurrachee. The junction of this line must more conveniently be effected by a branch from Baghdad *viâ* Howeizeh.

Sir FREDERIC GOLDSMID: Perhaps I may be allowed to say a few words as to what has fallen from Sir Arnold Kemball and Mr. Palgrave. I am quite aware that commercial considerations do not recommend the line that has been traced. I proposed it rather as one intended to meet an exigency, and which might be constructed in a very short time. With regard to the provision of water, it seems to me that the object contemplated would be worth the expense and trouble of wells. With regard to labour, I have no doubt there would be difficulty; but my opinion is that Arabs are very much inclined to give their labour if they can get what they are not accustomed to get—daily or weekly pay. I had once to dig a trench from the mouth of the Shat-el-Arab, the river conveying the combined waters of the Euphrates and Tigris to the sea. It was in length about three or four miles, and it was designed to bury the cable brought from the Persian Gulf up to a convenient spot for connection with the land-posts and wires of the Turkish Asiatic Telegraph. This part of the work was entrusted to me, and although rather novel in character, it was not distasteful, for it enabled me to acquire some knowledge of the Arab of the locality. It was not, however, an easy matter, for I could not at first get any sure amount of labour, and the labourers were somewhat refractory, that is, they were subordinate enough in one sense, but they were always fighting with one another. There were two main divisions, the Persian Arabs, and those from the Arabian side of the river, the Doásir and the Fas Arabs. However, it was my practice at the end of the day's work to make the men sit down in a ring and to see each one paid for his labour performed. This measure had an excellent effect. On the second day we got more than on the first, on the third more than on the second, and at last we got from three to four hundred men, who worked very well indeed. Physically speaking, they were just the set of labourers required for hard manual labour; and the week's experience showed me that, had we stayed where we were, we might have got as many men as we pleased. On the commercial question I will say little, but the railway would pass near enough to Mesopotamia to utilize it for the transport of grain from that renowned granary. After reaching the Euphrates it would in all probability become part of other systems which have in this been contemplated. I remember reading in a work on America that hotels were not commonly built there in places where there was any large number of residents and visitors, but where there were few or none. The hotel was not built to meet the requirements of a community, but the mere creation of an hotel attracted lodgers and frequenters, and the town followed. Much in the same manner a railway such as proposed (or say from Alexandretta), if it existed, would bring traffic to itself, and would, I believe, be found to be of great benefit commercially in its junction lines and generally in developing traffic and international intercourse. I will not trouble you with any further remarks on a very large question, and one on which much remains to be said, and will perhaps yet be said on a future or fitter opportunity.

The CHAIRMAN: I am not going to presume to say more than a very few words on the subject of Sir Frederic Goldsmid's paper, especially as it is one which he has considered so long, and which all the other gentlemen have spoken upon with large personal experience and knowledge. I certainly was very much struck with what Sir Arnold Kemball said, because what we have to recollect in this case, I think, is not so much how serviceable to us some things appear likely to be in certain contingencies, as how these things are to be carried out. There is only one way in which such a scheme as this can be carried out, I believe, and that is by the vote of the English Parliament; and the question is, what arguments can be brought forward which would be likely to move the English Parliament to take up and give money for such a scheme. I think that is the great difficulty. Even if we had a railway across this greater isthmus, as we may call it, it would only be, as far as I can see, in preparation for a contingency which might or might not occur for years: and during all those years of waiting until this contingency occurred, I think there can be no doubt we should be making use of the Suez Canal, and not of this railway, for the transport of troops and for all other important purposes. It seems to me

difficult to conceive how such an expensive line could be maintained, perhaps for many years, waiting for this contingency, which might or might not occur. Moreover, it seems to me that the strong communications of England will always be those which we can approach most nearly, and guard most effectively with our fleets and our ships. Now the Canal has in that respect a vast advantage, and always will have; and therefore it is, in my judgment, the line of communication on which we ought to concentrate our powers and efforts to preserve it open and accessible to us. As regards the possibility of its being blocked up, as Mr. Haddan indicated, no doubt this might very easily be done, but that is an argument why we should direct our energies, not only to securing our free use of the Canal, but also to the construction of a railway alongside of the Canal to meet such contingencies as that, in precedence of all other possible lines. That is a work which would be comparatively inexpensive, and the utility of which could not be questioned. However, as I said, I am not at this moment prepared to enter into a detailed discussion of the subject, and I shall pass on to a conclusion by moving the thanks of the meeting to our friend, Sir Frederic Goldsmid. I must say that I look with great admiration on a man whose time is so fully occupied as his is, and yet who grudges not to devote to a subject of this sort, not merely for the benefit of this Institution, but for the advantage of the public, who profit by his studies through these lectures, such an amount of labour, of rare experience, ability, and of originality, as he has gratuitously expended in the preparation of this lecture. I beg, then, now to propose that the thanks of the meeting be given to Sir Frederic Goldsmid for his admirable paper.

NAMES OF MEMBERS who joined the Institution between the 1st April and the 30th June, 1878.

LIFE MEMBERS.

Ingram, C. W., Capt. and Adjt. Glamorgan Art. Vols.
Christie, C. H. P., Lieut. R.E.
Hildyard, R. C. T., Lieut. R.E.
Dusgate-Dusgate, R., late Mid. R.N.
Seymour, J. H. Clume, Lieut.-Col. late 82nd Regt.
Turner, A. F., Lieut. R.N.
Tumilty, J. S., Major 1st Lanc. Rifle Vols.
Prendergast, T. J. W., Lieut. R.E.
MacEachran, Dugald, Capt. 1st Renfrewshire Rifle Vols.
Bailey, E. H., Capt. 4th Surrey Rifle Vols.

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Oliver, W. S., M.D., Surgeon-Major A.M.D.
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Bloomfield, J. A., Capt. and Adjt. 1st Lanc. Engineer Vols.
Becher, Edwd. F., Lieut. R.A.
Boyes, H. C., Capt. Lon. Rifle Brigade.
Carter, E. M., Lieut. 34th Regt.
Lane, R. B., Lieut. Rifle Brigade.
Emerson, A. L., Major 28th Regt.
Denshire, G. H., Capt. 51st Regt.
Kirkwood, Rev. Geo., Chaplain to the Forces.
McLeod, W. K., Col. late 74th Highlanders.
Finnis, J., Major 3rd Punjab Infantry.
Bruce, E., Lieut. 19th Bengal Lancers.
Powell, R. H., Dep.-Commissary A.S.C.
Buchanan, H. J., Col. late 9th Regt.
Elliott, Charles, Lieut. R.N.R.
Anderson, H. C., Col. Ben. Staff Corps.
Herd, W. G. R., Capt. 95th Regt.
Mayne, W. C., Capt. late 5th Fusiliers.
Bethune, Henry, Major late Roy. Surrey Militia.
Napier, C. J., Lieut. 31st Regt.
Orr, Spencer E., Capt. 94th Regt.
Chamberlayne, W. J., Major-General, Unattached.
Underwood, S. E., Capt. 2nd Middx. Rifle Vols.
Moore, W. J., Lieut. R.N.
Goldsmid, A. E. W., Lieut. 104th Regt.
McCall, J. G., Lieut. Tobago Rifle Vols.
McCall, James, Lieut. Tobago Rifle Vols.
McCall, John, Capt. Tobago Rifle Vols.
Elliot, J. W., Lieut. Tobago Rifle Vols.
McKillop, John, Lieut. Tobago Rifle Vols.
McCall, William, Lieut. Tobago Rifle Vols.
McGillivray, D., Capt. Tobago Rifle Vols.
Bevridge, J. Lock, Capt. late 12th Kent Art. Vols.
Cotton, R. B., Capt. 99th Regt.
Fyers, A. B., Lieut.-Col. R.E.
Hankin, Geo. C., Colonel 4th Bengal Cavalry.
Thompson, Ralph, Esq., C.B., Assist. Under-Secretary of State for War.
Tanner, J. A., Lieut. R.E.
Maude, Eustace, Lieut. R.N.
Hussey, W. C., Lieut. R.E.
Porter, R. da Costa, Lieut. R.E.

OCCASIONAL PAPERS, NOTES,

AND

NOTICES OF BOOKS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications, or books for review, may be addressed to

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ON THE ORGANIZATION AND STRENGTH OF THE GERMAN NAVY.

"THE Constitutional Statute of the German Empire," dated April 16th, 1871, recites, that the several Princes and States of Germany have formed "a perpetual union for the defence of the territory of the "Empire and the laws current therein, and for securing the welfare "of the German people." To provide for these objects, and to maintain public order in the country, some force under proper command was obviously necessary. This force was declared to consist of the Army and Navy. The administration of these two services, looked at from a constitutional point of view, differs considerably. The military forces of the German Empire are composed of the armies belonging to several states which formed part of the North German Confederation, or of the older union which existed prior to 1866. The Navy, on the other hand, is declared by the Constitutional instrument before mentioned to be a single undivided force under the command-in-chief of the German Emperor. The federal territory comprises the kingdoms of Prussia (as constituted subsequently to the treaty of Nikolsburg in 1866), Bavaria, Saxony, and Würtemburg, the Duchies of Baden and Hesse, and twenty minor states. At the head of this union of states stands the German Emperor, who represents the Confederation, and has the right (within certain limits) of declaring war and concluding treaties of peace. In general he conducts, or has conducted in his name, the more important foreign relations of united Germany. The body charged with making laws, which concern the whole Empire, consists of two chambers, a Federal Council to which each state in the Confederation deputes a member nominated by the particular Government in proportion to its population and importance, Prussia sending the greatest number, viz., seventeen, and the majority of the remaining states one each. The whole number amounts to fifty-nine. The other chamber, called the *Reichstag*, consists of nearly 400 members elected for three years by universal suffrage and the ballot. Every German, not serving in the active portion of the national defences, who is full twenty years of age, has the right to vote for a member of the *Reichstag*. The Chancellor of the Empire presides, *ex officio*, in the Federal Council. This parliament meets annually, and makes laws with the assent of the Emperor. The Council nominates seven standing committees, each of which has cognizance of some branch of public affairs, and must contain representatives of at least four different states. The naval committee is nominated by the Emperor.

Though the latter sovereign is at the head of the entire land forces of the Empire, the unity existing in the Navy is not found in the Army. For instance, the Army of Bavaria consists of two army

corps, and is, during peace, under the independent command and administration of its own sovereign. The Würtemburg troops are formed into a separate army corps, as also are those of Saxony. The two latter are clothed and equipped after the Prussian pattern, whilst the Bavarian Army retains its own uniform. Certain portions of the expenses due to the maintenance of their own forces are paid by both Bavaria and Würtemburg. In addition to the Prussian Minister of War there are similar ministers in each of the three other kingdoms.

The Navy, on the other hand, belongs solely to the Empire at large, and is composed of the forces of no particular state. That is, in the legal sense, for in reality it is merely an expansion of the former Navy of Prussia, the only state of any size in the Confederation which the physical geography of the country permitted to be a maritime Power. The organic law of the Empire, before quoted, states, that—

"The Navy of the Empire is a single force under the supreme command of the Kaiser. The organization and composition thereof are determined by him; he appoints the Officers and departmental directors, who, together with the men of the fleet, take the oath of allegiance to him. Kiel and Jade (Wilhelmshaven) are Imperial naval ports. The sums necessary for the formation and maintenance of the Imperial fleet, and of the various establishments thereto belonging, are defrayed from the war-chest of the Empire. The whole nautical population of the Empire, including marine engineers and those belonging to the ship-building trades, is released from service in the Land Army, and instead, is liable to service in the Imperial Navy. The distribution of recruiting requirements is regulated with a due regard to the proportion of the seafaring population, and the *quota* appointed for each state is deducted from its liability to the land service."

The department of the German Government immediately charged with the administration of the Navy is the Imperial Admiralty, at the head of which is an official named the "Chief of the Admiralty." He conducts the business of his department under the responsibility of the Imperial Chancellor, and exercises the chief command under the Emperor. The orders of the latter must be countersigned by the Chancellor, with a view to establishing the principle of ministerial responsibility in force in constitutional monarchies, which the German Empire claims to be. The Admiralty is divided into a central division and several sections. Its composition is as follows:—

Admiralty at Berlin.

Chief (with the rank of Admiral), a Minister of State, who is entitled to represent his department in the Federal Council, and is a member of the Naval Committee.

Central Division.—A Commander in the Navy.

A. *Military Sections.*

Chief of the Staff—a Rear-Admiral.

Sect. I*a*. Preparation for war and mobilization of the fleet.

„ I*b*. Naval affairs (military branch).

Sect. II. General military affairs.
„ III. Training, intelligence, and coast defence.
Martial law department.
Sect. XII. Sanitary and medical affairs.

B. *Technical Sections.*

Director—A Vice-Admiral.
Sect. IV. Equipment.
„ V. Dockyards and port administration.
„ V*a*. Accidents, collisions, &c.
„ VI. Naval construction.
„ VI*a*. Ship's history, inventories, and lists of stores.
„ VII. Construction of machinery.
„ VII*a*. Steam factories, repair of boilers.
„ VIII. Gunnery, arms, fortification of ports.
„ T. Torpedo affairs.

C. *General Sections.*

„ X. Returns and finance.
„ XI. Garrison administration.
„ XI. Service, travelling expenses, daily pay, &c.
„ XIII. Legal matters.
„ R. Audit of accounts.
„ IX. Harbour works.
„ IX. Buildings.

In addition, there is a hydrographical department, under the superintendence of a Post-Captain. It has two sections:—
Section H I, surveys, chart-drawing, pilotage, &c.
„ H II, scientific matters and literary work.
There are also three Admiralty Commissions and, at Hamburgh, a Board for the supervision of German light-houses.

The coasts of the Empire are divided into two naval stations, viz., the Baltic and the North Sea. The head-quarters of the Baltic station are at Kiel. The supreme authority is in the hands of a Rear-Admiral, whose official designation is "Chief of the Naval Station." Under him are the 1st division of seamen, the division of boys, the 1st dockyard division, the battalion of marine infantry, the dockyards at Danzig and Kiel, the naval artillery and depôt at Friederichsort, the naval academy and naval school, the station commissariat department, the clothing store, and other branches of the public service in his district. The Staff is composed of three Aides-de-Camp, a Captain of the Port, a Medical Officer, two Accountant Officers, two Chaplains (one a Roman Catholic), and an Intendant or Commissary of Supplies. The Commandant of the place is a Colonel of the Army; the Town-Major an Officer of Marines.

The 1st division of seamen is commanded by a Post-Captain. It is divided into five detachments (each of two or three companies). These detachments are numbered consecutively from I to IV, but the fifth is named the Seamen Gunners' Detachment. The division of boys is under a Commander; it has an Adjutant, a Paymaster, a Chaplain,

and five Officers in charge of detachments. The 1st dockyard division is commanded by a Post-Captain. It is divided into two detachments, the 1st of engineers, and the 2nd of shipwrights and men of allied trades. Each is under a Senior Lieutenant. A Lieutenant-Colonel commands the marine battalion, of which the head-quarters and Staff, with four companies, are at Kiel, and two companies are at Wilhelmshaven.

The dockyard at Danzig is superintended by a Post-Captain, and the several departments are under the following functionaries:—a Director of Equipment, who is a Commander; a Director of Construction, a Director of Machinery, and an Administrative Officer, also styled Director. The Kiel yard is likewise under a Post-Captain, with two assistants; and, in addition to the functionaries specified as conducting the duties at Danzig, there are also a Director of Ordnance and one of harbour works. At Kiel are situated the naval academy and the naval school; the former under a Director (a seconded Officer of marines). The three classes ("*cötus*") are each under a Senior Lieutenant. The Director of the academy is also head of the naval school. Another school, that of engineering and navigation, is likewise at Kiel; its Director is a Commander.

Wilhelmshaven, on the Bay of Jade, is the head-quarters of the North Sea station, which is also commanded by a Rear-Admiral. The Staff is similar to that of the Baltic. The command embraces the 2nd division of seamen, the 2nd dockyard division, the Wilhelmshaven dockyard, the marine artillery depôt, the pilot service, the observatory, the station intendance, and other departments. Tho divisions of seamen and of the dockyard are divided into detachments, in like manner with those at Kiel. At the head of this dockyard is a Post-Captain, with a Staff of Directors, the same as at the Kiel yard. The naval artillery depôt is commanded by a Major, and, in addition to the artillery Officers, contains a Torpedo Sub-Lieutenant, and six torpedoists; the latter wear a special uniform.

The Officers of the Imperial Navy are divided into three separate sections, viz., the Admiral's Staff, the Sea Officers, and the Naval Staff. The Admiral's Staff is thus described:—"It is an establish-
"ment in the German Navy corresponding to the General Staff of the
"Army, that is, it is a department on which devolves the duty, with
"respect to the organization and distribution of the Navy, of executing
"and transmitting the orders of the Commander-in-Chief." The Admiral's Staff consists of three Officers, who are appointed to superintend the organization of the Navy, and the improvement and perfection of the active forces. These Officers are promoted on a separate list. The Sea Officers are those who are engaged in the practical duties of the service afloat. The Naval Staff is composed of those who show some special aptitude for the several branches of technical work required in the Navy. The lists are made up as follows:—

Admiral's Staff.....	1 Captain.
	9 Commanders.
	7 Senior Lieutenants.[1]

[1] In German *Capitain-Lieutenants*, who occupy the same position as our Lieutenants of 8 years' seniority.

Sea Officers	13 Captains.
	27 Commanders.
	53 Senior Lieutenants.
	117 Lieutenants.
	120 Sub-Lieutenants.
Naval Staff	1 Captain.
	6 Commanders.
	5 Senior Lieutenants.
	1 Lieutenant.
(Not Classed)	56 Midshipmen.
	36 Cadets.

The relative rank of Officers of the Army and Navy is much the same as that which is laid down in the regulations of our own service. There are four classes of Officers:—

Army.	*Navy.*
1. General Officers.	1. Flag Officers.
Field Marshal.	
General.	Admiral.
Lieutenant-General.	Vice-Admiral.
Major-General.	Rear-Admiral.
2. *Field Officers.*	
Colonel.	Captain.[1]
Lieutenant-Colonel.	Commander.
Major.	
3. *Company Officers.*	
Captain.	*Capitain-Lieutenant.*
4. *Subalterns.*	
1st Lieutenant.	Lieutenant.
2nd Lieutenant.	Sub-Lieutenant.
Warrant and Non-Commissioned Officers.	
Sergeant-Major.	Warrant Officers, but senior to all ranks.
Ensigns.	Midshipmen.
Sergeants.	1st-Class Petty Officers.
	2nd-Class Petty Officers.

The pay of Officers of various ranks is given below:—

Vice-Admiral	£660
Rear-Admiral	495
Captain	420
Commander	315
Senior Lieutenant.....	225
„ „	165

[1] Captains commanding squadrons are styled "Squadron Chiefs," and fly a Commodore's burgee. As in the British service, Commodore is not a substantive rank.

Lieutenant	£75
Sub-Lieutenant	60

Medical Department.

Surgeon-General	£300 to £420
Chief Staff Surgeon	210 to 270
Staff Surgeon	138
Assistant-Surgeon	60 to 69

Engineers.

Director	300 to 360
Chief Engineers	300
Engineer	225
Sub-Engineer	180

The above corresponds nearly with the "Half-Pay" of the British Service, Officers receiving it whether afloat or ashore. The additions are an allowance for messing when on board ship, and lodging allowance when on land.

Cadets must enter the service before the completion of their seventeenth year; but, in case of those who have passed the matriculation examination at a University, two years in addition are allowed. The examination takes place at Kiel annually, in April. Those who have qualified for admission to a University are exempt from examination. The cadets join the school-ship in April, and go for a cruize in the Atlantic or Mediterranean until September. Only such as show, on this trial cruize, that they possess the necessary qualifications for a seafaring life, are finally admitted to the school. They then are required to pass the examination for sea-cadet or midshipman. They next join a training-ship for two years, at the end of which they have to present themselves for the examination necessary to become Sub-Lieutenants. In all, four scientific examinations have to be passed, and three years' sea service has to be counted by the candidates before they become commissioned Officers. From October to August, in the last year of training, they attend the Officers' class at the naval school. When the final examination is passed, each Officer has to be balloted for by the Officers of the station to which he is to be attached. On their vote depends his admission to the service. Other examinations have to be passed before attaining the rank of Lieutenant. The two educational establishments for Officers are the Naval Academy and the Naval School. The Academy fulfils the same object for the Navy as the War Academy does for the Army. The course at it is two years. The school answers to the war schools of the land service, and, since 1865, has taken the place of the former institution for naval cadets at Berlin. The course at it lasts eleven months, divided into two terms.

Promotion in the German Navy goes practically by seniority. Owing to the enormous increase of the Service within a very few years, the age of most of the Officers is much lower than that of the members of the Services of other countries. The date of commission of the senior Captain is February 15th, 1871, of the senior Com-

mander January 23rd, 1871, of the senior Lieutenant February 27th, 1872. Only two Officers on the Captain's List count as much as twenty years' sea service in all.

Every German is liable to service in the Army or Navy, and substitutes are not allowed. Exemptions are permitted to members of reigning families, and of mediatized and other houses exempted by conventions or by special right, and to some others duly enumerated in the law of recruiting. The liability to serve begins with the completion of the seventeenth year, and ends with that of the forty-second. Of this time twelve years must be passed in the fleet and in the *Seewehr*. On the 1st January of the year in which the twentieth birthday occurs every one must enter the standing Army or join the fleet. The regulations prescribe that any youth, whose physical and moral qualifications are satisfactory, may volunteer to join the Service on completing his seventeenth year. The period of voluntary service is either one year or three years. With regard to the one year's service the provisions of the law are as follows :—

Seamen by profession who have passed the Navigator's Examination at a North German Navigation School are enrolled at once in one of the divisions of seamen. They must have been employed at least one year at sea, or in the coasting trade, or in the deep-water fishery. Having once entered they are compelled to serve in the ship to which they belong until her return to a home port. They are not required to provide their clothing nor maintain themselves. Volunteers are admitted under similar regulations into the engineer branch of the Service and to the dockyard divisions. The latter are required to find their own clothes and subsistence.

Volunteers for three years' service who wish to join as sailors must have been employed at the least one year in some seafaring occupation. Persons may enrol themselves for the same period in either the engineer detachment or the shipwright detachment of the dockyard divisions.

The division of boys is intended to train seamen and petty officers for the Imperial Navy. The period of training is three years. At the completion of the training the boys are rated seamen, and join one of the divisions. Promotion to leading seaman's and petty officer's ratings depends upon the conduct and qualifications of the lads who have been under instruction. Those who do not come up to the standard required at the end of three years' instruction may be retained to undergo a fourth year's training. Nine years in addition have to be served after enrolment in a division. The age of entry of boys is between fourteen and seventeen. There are two training ships for cadets, one for boys, and three brigs : the three last are at present in the reserve.

Length of service in the Navy is, as has been stated, twelve years in all. Of these three are passed in the active Navy, seven in the Reserve, and five in the *Seewehr*. Formerly men for the Navy were raised exclusively from the seafaring population of maritime states; but it has been found necessary, in order to obtain sufficient numbers, to draw upon the shore-going population. Volunteers who engage to

serve for four years may be entered, though they have not made long voyages. The annual contingent of recruits for the Navy is estimated at 2,500 men.

The Officers of the Naval Reserve are—

1 Senior Lieutenant.
1 Lieutenant.
25 Sub-Lieutenants.
22 Midshipmen.
1 Cadet.
1 Assistant Paymaster.

The Officers of the *Seewehr* are—

2 Senior Lieutenants.
14 Lieutenants.
19 Sub-Lieutenants.
3 Auxiliary Lieutenants.
2 Second Lieutenants.
2 Assistant Paymasters.

The number of men and boys at present is as follows :—

Seamen Divisions.

89 warrant officers.
14 writers.
593 petty officers.
4,628 seamen.

Boys' Division.

1 warrant officer.
1 writer.
9 petty officers.
400 boys.

Dockyard Divisions.

134 warrant officers.
4 writers.
1,548 petty officers and men.
68 hospital attendants.

Naval Police.

75 Masters-at-Arms and Sergeants.

The maritime forces consist of a detachment of artillery and an infantry battalion. The artillery detachment was ordered in April, 1877, to be broken up and be replaced by a detachment of seamen gunners. This order does not appear to have been fully carried out as yet, as Officers of marine artillery still appear on the Navy List. The detachment comprised three companies, commanded by a Major. The other Officers were three Captains, three First Lieutenants, and seven Lieutenants. The non-commissioned officers and men numbered from 457. The strength of the infantry battalion is—

1 Lieut.-Colonel Commanding.
6 Captains.
6 First Lieutenants.
19 Lieutenants.
1,035 Non-commissioned officers and men.

The battalion is divided into six companies, and the naval police is attached to it. Two First Lieutenants and eight Lieutenants belong to the Reserve and the *Seewehr* of the marines.

The Torpedo Corps of the German Navy is officered by a Torpedo-Lieutenant and two Torpedo-Sub-Lieutenants. The torpedo men are divided into several classes, viz., chief torpedoists, who rank with first class warrant officers; torpedoists, who rank with those of the second class; chief torpedo mates, ranking with sergeants, and torpedo mates with corporals. A Torpedo Committee, composed of Officers of the Navy and Military Engineer Corps and a scientific chemist, sits at Berlin.

The Medical Department of the German Navy is composed of—

1 Surgeon-General, 2nd class.
2 Chief Staff Surgeons, 1st class.
3 „ „ „ 2nd class.
15 Staff Surgeons.
13 Assistant Surgeons, 1st class.
10 „ „ 2nd class.
2 Under Surgeons.

In the Engineer Department there are—

2 Chief Engineers.
6 Engineers.
9 Sub-Engineers.

The junior ranks of the department are petty officers (*maat*), and are not included in the list of Officers.

The Accountant Department contains—

15 Paymasters.
27 Sub-Paymasters.

The Chaplain's Department consists of—

7 Chaplains (Evangelical).
1 „ (Roman Catholic).

The dockyards are three in number, situated at Danzig, Kiel, and Wilhelmshaven. The two latter, as has been stated above, are Imperial naval ports. Danzig, in the eastern part of Prussia, stands on a river thirty-five miles from the coast of the Baltic. It is a fortress of the first class, and contains 87,650 inhabitants. In 1872 the *Reichstag* voted sums amounting to upwards of 520,000*l.* to strengthen its defences and form a naval yard. The works still continue. The yard was to be completed by this year (1878), and the new harbour by 1887. The object of establishing a naval yard at Danzig is said to be to have a repairing station and depôt for a fleet operating in the Baltic.

Kiel is situated on the eastern coast of the province of Holstein.

The harbour is large and has room for the largest ships. The depth of water varies from six to nine fathoms. Deep water extends so close in shore that the heaviest ships of war can lie alongside the wharves. The harbour is but little affected by tides. Though its strategic position is not considered very superior, still Kiel is one of the greatest naval ports in the world. On both sides of the entrance stand the strong fortifications of Friederichsort. The population is, 40,000.

Wilhelmshaven is on the coast of the North Sea in the district of Jade, on the bay of which name it stands. It was established as a German naval port in 1869. It is strongly fortified both on the sea front and on the land front. The works of the dockyard are on a very extensive scale, and large sums of money have been spent within a few years upon them and upon the fortifications. The principal basin is about 400 yards long and 250 wide. The population, exclusive of the persons employed in the Government establishments, is unimportant. The strategic situation of Wilhelmshaven is good, inasmuch as it gives to the Empire a port which cannot be so easily blockaded as those in the Baltic. The latter sea can be entirely closed by a superior naval power, whereas Wilhelmshaven, being on the North Sea, has access to the ocean. A canal, one side of which is on the foreign territory of the Netherlands, has been constructed to facilitate communication with the port in time of war.

The guns mounted in the ships and ships' boats of the German Navy are those constructed on Herr Krupp's well-known system. They are all breech-loaders. The carriages are of iron. A peculiarity of the breeching fittings of broadside guns is that the bight is towards the ship's side where it is dropped over hook-shaped breeching-bolts, and that the ends—in each of which an eye enclosing a thimble is spliced—are attached to the brackets of the carriage. The 30½ centimetre (12-inch) gun is carried by the armoured gunboats "Wespe" and "Viper." Turret-ships and the central battery-ships of recent construction carry 26 centimetre (10-inch) guns. The "König Wilhelm" is armed with eighteen 24 centimetre (9½-inch), and five 21-centimetre (8¼-inch) guns. The "Hansa's" guns are eight 21-centimetre pieces. The lighter guns carried in some ships are 17 centimetres (6½ inches). The boat-gun is a piece of 8 centimetres (3 inches) calibre. Details of the above guns follow :—

Nature.	Weight met. tons.	Battering shell.		Shell.		Charge.		Energy of battering shell.	Thickness of armour pierced.
		Weight.	Burster.	Weight.	Burster.	Batt'ring	For shell.		
c.m.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	foot-tons.	inches.
30½	35·6	740	9½	610	32½	158½	158½	12,221	10½
26	18	412	5¼	361	17¼	105½	105½	6,802	8½
24	14·5	310	3¼	261	15½	59½	44	4,625	7¼
21	9	216	2¾	174	10¼	35¼	26½	2,587	5¼
17	4·5	120	1¼	99	6½	17½	14½	1,398	3¾
8	·23	..	..	7½	¾	..	1		

The above are approximate to avoid small fractions. The metric ton is somewhat lighter than the English. The kilogram has been taken as = 2·2 lbs.

The rifled small arms in use in the Navy are of a pattern similar to that with which certain corps in the land service are armed. Whilst many improvements and alterations are being made the Government is careful to keep the fleet supplied with the best weapons.

It has already been said that there exists a special torpedo service, of which the officers and men wear a particular uniform. Their work seems to be chiefly in the laying down of defensive torpedoes for the protection of the coasts and harbours of the Empire. Torpedo experiments were begun in North Germany in 1868, but no conclusions as to the best system to be adopted had been reached when the war with France occurred in 1870. The consequence was that a very small amount of torpedo stores were at hand; and in the early days of the war old beer casks, and similar articles, were made use of as the cases of contact torpedoes on Jacoby's system, with which to defend the most exposed parts of the coasts. But pear-shaped cases of iron were introduced as soon as possible. The torpedoes used by the Germans during the war are thus described: 1. Contact torpedoes with fuzes on Jacoby's system. The glass tube containing the sulphuric acid was enclosed in a leaden tube. The latter was to be bent on the torpedo being struck by a ship and the glass broken. The charge of the mine was 75 lbs. of powder or other explosive; and it was moored with chains and stones. 2. Electric torpedoes with platinum wire fuzes to be fired by observers, provided with glasses on shore. The charge was 10 cwt. of powder, and they were anchored with stones or mud anchors. 3. Harvey torpedoes of the usual pattern. 4. Spar torpedoes worked from boats. Of late, in common with other maritime powers, Germany has paid much attention to the improvement of torpedoes. The Torpedo Committee is a permanently constituted body, and many experiments have been carried out under its direction. The object of these has been stated to be, to find out: 1st. The best mode of anchoring; 2nd. The most useful form of case; 3rd. The best manner of laying out mines and the distances at which they should be placed from each other; 4th. The best material for the explosive used as a charge and the one least likely to deteriorate by long immersion; 5th. The best description of fuze. As a result of these experiments the present state of the torpedo service in the German fleet is probably not inferior to any in the world. On the list of the Navy there are at present seven torpedo vessels; of these two are designated "mine-layers" and two "*prahms* for mines." The "Zieten" was built in England and launched in May, 1876. She is 196 feet long, has 28 feet beam, and draws 11 feet 6 inches. She is 873 tons, her indicated horse-power is 2,350, and she has made sixteen knots. She has a complement of ninety-one. The hull is constructed of iron and she carries, in the bow and in the stern, apparatus for launching fish torpedoes under water. The tubes are 4 feet 3 inches under water, 16½ feet long, and 1¼ feet in diameter. The "Uhlan," built at Stettin and launched in 1876, is 72 feet long, has 26 feet

beam, and draws 13 feet of water. Her tonnage measurement is 364, and the engines work up to 800 indicated horse-power. The keel-line of the vessel is produced forward to a length of 32 feet in the form of a spur made of steel; at the extreme end of this a torpedo is to be fixed. It is proposed to adopt with this vessel the manœuvre of running against an enemy and exploding the torpedo in contact. In order to secure the craft against the explosion of her own torpedo the fore part is double. In the space between the inner and the outer skin is inserted an elastic mass composed of a mixture of cork and marine glue, so that—in case of injury to the outer plating—the vessel may still remain afloat.

The Officers of a German man-of-war are distributed into messes somewhat in the same way as in the British Navy. The Captain messes alone. Ships are—as a rule—commanded by Captains and Commanders, gunboats by senior Lieutenants. Occasionally a Commander is second in command of a large ship; but almost invariably that office is filled by a Senior Lieutenant (*Capitain-Lieutenant*). The Officer next in seniority to the second-in-command is usually charged with assisting the Captain in the navigation of the ship. He has charge of the charts and instruments of navigation, and makes the necessary astronomical and meteorological observations, under the supervision of the Captain. The next senior Officer is usually styled "*Batterie Commandeur*," and has a general superintendence of the exercise of the heavy guns. Officers commanding "quarters" or divisions of guns are styled "*Batterie Offiziere*." This includes those who superintend the passage of ammunition in action, and command divisions of sail-trimmers, boarders, small-arm men, and riggers. The second-in-command heads the landing-party of small-arm men, &c., whilst the Captain, the navigating Officer, and the Battery Commander remain in the ship. The remaining Officers are divided into watch-keepers (*wachthabende Offiziere*), and mates of decks (*oberdecks Offiziere*). The whole number of Officers and men of a ship are thus divided:—

I. *Staff* (*Stab*).

Captain.
Second in command.
Navigating Officer.
Battery Commander.
Watch-keepers.
Sub-Lieutenants.
Midshipmen.
Cadets.
Marine Officers.
Engineers.
Medical Officers.
Paymaster.
Chaplain.

II. *Under Staff* (*Unter-Stab*).

Junior Accountant Officers.
Writers.
Ship's police.
Ship's cook.
„ stewards.
Assistant stewards.

III. *Seamen personnel.*

Gunner and crew.	Seamen.
Boatswain and petty officers.	Boys.
Leading seamen.	

IV. *Engine-room personnel.*

Leading engineers.	Engineer's mates.
Watch-keeping ditto.	Stokers.

V. *Artificer personnel.*

Carpenter and crew.	Butcher.
Sailmakers.	Sick berth attendants.
Armourers.	Shoemaker.
Painters.	Tailor.

VI. *Marines.*

Sergeant.	Buglers and drummers.
Corporals.	Privates.

VII. *Servants.*

Officers' cooks.	Officers' stewards.

The ships of the German Navy are divided into two classes: (1) ships, and (2) vessels (*Fahrzenge*) There are four rates of ships and three classes of vessels.

- Ships
  - Rate
    - I — "König Wilhelm," &c.,
    - II — "Kronprinz," "Friederich Carl," "Preussen," "Renown" (gunnery ship),
    - III — Main-decked corvettes,
      - Sailing frigates — Guard ships, Training ships for cadets,
    - IV — Flush-decked corvettes — "Victoria," "Augusta," "Frega," "Ariadne," "Louise," "Medusa," "Nymphe,"
      - Armoured "vessels" — "Arminius," "Prinz Adalbert,"
      - The Royal yacht,
      - Boys' training brigs,
      - Cadets' „ „

- Vessels
  - Class
    - I — "Preuss," "Adler," "Nautilus," "Albatross," "Falke,"
    - II — "Pommerania," Despatch boat, Gunboats of 60 h.p.
    - III — „ „

The following is a list of the complement of a large first-rate iron-clad of the "Kaiser" class:

Commanding, 1 Captain.
Second in command, 1 Commander
Navig. Officer, 1 sen. Lieutenant.
Battery Comm., 1 ditto.
Watch-keepers, 4 do. or Lieuts.
7 Sub-Lieuts.
12 Midshipmen.
1 First Lieut. of Marines.
1 Engineer Officer.
1 Chief Staff Surgeon.
2 Assist.-Surgeons.
1 Paymaster.
2 Assist. ditto.
1 storekeeper.
1 writer (petty officer).
1 master-at-arms.
3 ship's corporals.
3 lance corporals.
1 petty officer, ship's cook.
1 leading seaman do.
1 steward (petty officer).
1 assist. ditto.
1 chief gunner.
1 chief gunner's mate.
4 gunner's mates.
1 chief boatswain.
8 chief boatswain's mates.
18 boatswain's mates.[1]
80 leading seamen.[1]
234 seamen.

3 leading engineers.
3 engineers.
5 chief engineer's mates.
11 engineer mates.
2 leading firemen.
5 firemen.
17 leading stokers.
51 stokers.
1 chief carpenter.
2 carpenter's mates.
1 leading carpenter's crew.
4 carpenter's crew.
1 chief sailmaker's mate.
1 sailmaker's mate.
2 sailmaker's crew.
1 chief armourer's mate.
1 painter.
1 painter's crew.
1 butcher.
1 chief sick berth attendant.
2 assistant ditto.
2 shoemakers.
1 tailor.
1 sergeant.
5 corporals
1 drummer
1 bugler
70 privates
} marines.
4 Officers' cooks.
4 Officers' stewards.

Total 600.

Marines are only embarked in the 1st and 2nd rates. From the above list it will be seen that, not including the Officers or warrant officers, and omitting even the sailmakers, there are 345 *bonâ fide* blue jackets among the ship's company.

The seafaring population of the Empire is estimated at 80,000.[2] The number of merchant vessels is 4,809,[3] of which 318 are steamers. The four great Trans-Atlantic steamship Companies are—

1. The Hamburg American Joint Stock Packet Company.
2. The North German Lloyd.
3. The Hamburgh South American Steam Navigation Company.
4. The German Trans-Atlantic Steam Navigation Company, or "Eagle line."

Of the Hamburgh American Company nine ships of from 2,500 to 3,200 tons are on the New York line; three of from 2,500 to 2,900

[1] The boatswain's mates include captains of parts of the ship.
[2] Of whom 6,000 are in foreign employ.
[3] Total tonnage 1,103,650, of which 180,946 tons are steam.

tons on the New Orleans line; three of 2,200 to 2,500 tons on the West Indies line. For the above routes four ships of from 3,000 to 3,500 were building or nearly complete last year; and three of 1,200 tons were being built for the inter-colonial service. There are two vessels for European voyages, and three river steamers also belonging to the Company.

The North German Lloyd has fourteen steamers of from 3,048 to 4,434 tons on the New York line; four of from 3,050 to 3,090 tons on the Baltimore line; four of from 3,262 to 3,900 tons on the New Orleans line; two of the West Indies line; one of 1,377 tons for inter-colonial service; six building or nearly complete for the above-mentioned lines; nine steamers of from 718 to 1,025 tons to run between London, Hull, Leith, and Antwerp, and Germany; besides fourteen vessels for river and coast trade.

The Hamburgh South American Company plies between Germany and the South American ports of Bahia, Rio de Janeiro, Santos, Monte Video, and Buenos Ayres. It has six steamers of from 2,000 to 3,500 tons.

The "Eagle Line" vessels in general measure about 3,600 tons, and run between Hamburgh and New York. Though only established in 1873, it has four ships running, and steps have been taken to add to them four more. The whole of the above vessels may be regarded as supplying an important reserve both of ships and sailors to the Imperial Navy.

The Navy Estimates for the financial year 1877–8 were for

Regular expenses.....	£1,114,230
Special expenses.....	1,284,611
Total.....	£2,398,841

The following is an official list of the ships and vessels of the German Navy, as given in the Admiralty List for the present year:—

Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Complement.	Present service.
		Englis				
A. Fighting Ships.						
1. *Armoured Frigates.*						
"König Wilhelm".....	23	5,939	9,603	8,000	700	Reserve.
"Kaiser".....	9	4,586	7,559	8,000	600	Do.
"Deutschland".....	9	4,586	7,559	8,000	600	Do.
"Friederich Carl".....	16	4,003	5,912	3,500	500	Do.
"Kronprinz".....	16	3,404	5,480	4,800	500	Do.
"Friederich der Grosse"	6	4,118	6,663	5,400	500	Making trial cruizes.
"Preussen".....	6	4,118	6,663	5,400	500	In commission with reduced crews.
"Grosser Kurfürst"....	6	4,118	6,663	5,400	500	Building.

Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Complement.	Present service.
		English tons.				
2. Armoured Corvettes.						
"Hansa"	8	2,372	36,110	3,000	380	Reserve.
"A"	6	5,034	..	5,600	..	Building.
"Sachsen"	6	5,034	..	5,600	..	Fitting out.
"C"	..	..	..	..	..	Building.
"D"	..	..	..	..	..	Do.
B. Cruisers.						
1. Main-decked Corvettes.						
"Elizabeth"	19	1,996	2,468	2,400	380	Cadet training ship, China station.
"Hertha"	19	1,846	2,264	1,500	380	Mediterranean.
"Vineta"	19	1,846	2,264	1,500	380	Reserve.
"Gazelle"	18	1,691	2,067	1,300	380	Mediterranean.
"Leipzig"	12	2,856	..	4,800	425	Training ship, China station.
"Sedan"	12	2,856	..	4,800	425	Fitting out.
"Bismarck"	16	2,353	..	2,500	..	Do.
"Blücher"	..	..	..	..	..	Do.
"Moltke"	..	..	..	..	..	Do.
"Stosch"	..	..	..	..	..	Do.
"D"	..	..	..	..	..	
2. Flush-decked Corvettes.						
"Freya"	8	1,663	1,985	2,400	230	China station.
"Ariadne"	8	1,309	1,692	2,100	230	Australia.
"Luise"	8	1,309	1,692	2,100	230	Reserve.
"Augusta"	10	1,550	1,796	1,300	230	Australia.
"Victoria"	10	1,550	1,796	1,300	230	Reserve.
3. Gun Vessels ("Albatross" Class).						
"Albatross"	4	601	705	600	95	China station.
"Nautilus"	4	601	705	600	95	Do.
4. Gunboats, 1st Class.						
"Comet"	4	304	347	250	64	Mediterranean.
"Cyclops"	4	350	..	250	64	China station.
"Delphin"	3	304	347	250	64	Reserve.
"Drache"	3	304	347	320	64	Do.
To replace "Meteor"	4	428	..	340	64	Building.
" "Blitz"	4	428	..	340	64	Do.
" "Tiger"	..	..	..	..	..	Do.
C. Coast Defence Vessels.						
1. Armoured Vessels.						
"Arminius"	4	1,230	1,583	1,200	130	Reserve.
"Prinz Adalbert"	3	779	1,479	1,200	130	Do.

Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Complement.	Present service.
		English tons.				
2. Armoured Gunboats.						
"Wespe"	1	784	..	700	64	Fitting out.
"Viper"	1	784	..	700	64	Do.
"Biene"	1	784	..	700	64	Do.
"Mücke"	1	784	..	700	64	Do.
"Scorpion"	1	784	..	700	64	Do.
"F"	..	..	..	..	..	Building.
"G"	..	..	..	..	..	Do.
3. Torpedo Boats.						
"Zieten"	..	..	..	2,350	91	Kiel.
"Uhlan"	..	364	..	800	..	Do.
Minelayer No. 1 to 5	..	24	..	60		
Do. No. 6	..	34	..	80		
"Rival"	..	129				
Mining-prahm "Basilisk"	..	304				
Do. "Pfeil"	..	239				
4. Gunboats, 2nd Class.						
"Fuchs"	1	239	264	220	40	Reserve.
"Hay"	1	239	264	220	40	Do.
"Natter"	1	239	264	220	40	Do.
"Salamander"	1	239	264	220	40	Do.
"Sperber"	1	239	264	220	40	Do.
"Otter"	3	..	..	..	..	Fitting ont.
D. Despatch Vessels.						
"Falke"	2	1,030	..	1,100	90	Reserve.
"Pommerania"	..	406	..	700	44	Mediterranean.
"Loreley"	2	332	398	350	56	Tender, Wilhelmshaven.
"Grille"	..	493	..	650	52	Imperial yacht, Reserve.
"Hohenzollern"	2	1,500	..	3,000	120	Do.
E. Transports.						
"Rhein"	..	279	428	200	23	Reserve.
"Eider"	..	146	..	120	16	Do.
F. Training Ships.						
1. Line-of-Battle Ship.						
"Renown"	23	3,318	5,519	3,000	200	Gunnery ship, Wilhelmshaven.
2. Sailing Frigate.						
"Niobe"	10	1,052	1,290	..	240	Reserve.
3. Main-decked Corvette.						
"Arcona"	18	1,691	2,067	1,300	380	Reserve.

Name.	Guns.	Tonnage.	Displacement.	I.H.P.	Complement.	Present service.
		English tons.				
4. Flush-decked Corvette.						
"Medusa"	9	970	1,183	800	240	Boys' training ship, West Indies.
"Nymphe"	9	970	1,183	800	240	Reserve.
5. Sailing Brigs.						
"Rover"	6	550	..	..	150	Do.
"Mosquito"	6	550	..	..	150	Do.
"Undine"	6	608	..	..	150	Do.

G. Vessels for Harbour Service.

(This class contains small steamers, tugs, floating barracks, and pilot vessels. The whole number on the list is eighteen.)

Of the armoured vessels on the above list only two, the "Hansa" and "Prinz Adalbert," are of wood. The others are built of iron, and in their construction nearly all the most recent improvements in iron war-ship building have been introduced. Few, if any, of them, however, have the longitudinal bulkhead dividing the boilers, which has been adopted in the later English armoured ships. The most powerful vessels have been built in England, but the Vulcan Company's Works near Stettin, as well as the Government yards, are capable of turning out formidable vessels. The "Grosser Kurfürst," for instance, was built at Wilhelmshaven. Great efforts have been made to increase the capabilities of the steam factories and engine works of the country, so that the Empire should be no longer dependent, as it has been, upon foreign manufacturers for the supply of machinery for even the largest ships. A recent statement has been published to the effect that this is now the case, and that the Imperial Navy will no longer have to look abroad for engines for its vessels of any class.

The want of properly qualified seamen for both the Government Service and the mercantile marine having been felt for some time past in Germany, efforts have been made by private persons interested in the shipping trade to establish training vessels for boys with a view to their becoming apprentices to the seaman's calling. These efforts have been encouraged by the Government, which naturally sees in them a probability of strengthening considerably the available Naval Reserve, all the seafaring population being liable to service in the Imperial Navy.

The ships in commission are distributed over four foreign stations as well as the home waters. These stations are—(1.) the Mediterranean, with four vessels, under the command of a Post-Captain as Squadron-Commander; (2.) the China, or East Asiatic station, with six vessels; (3.) the South Pacific, with two; and (4.) the Western

Atlantic, with one. Other vessels, as appears from the list of the Navy given above, are making detached cruizes in foreign waters. At home there are two sea-going ironclads in commission. It has for some years past been customary to assemble a squadron of armoured ships for exercise in various evolutions and manœuvres each summer, and keeping them together till the early autumn, when the ships are laid up.

CYPRIAN A. G. BRIDGE, Captain.

THE RUSSIAN NAVY IN 1877.

(Translated from the *Révue Maritime*, April, 1878.)

AT the moment of the declaration of war the Russian Baltic Fleet was still imprisoned in its harbours by thick ice. Political circumstances did not allow any active participation on its part in the war to be foreseen; it was only equipped for a single cruise of the ordinary kind, and its resources, in any case, would but suffice to recruit the detachments of seamen required on the Danube. In the Black Sea there were only circular ironclads, intended especially for coast defence, some old lightly-armed corvettes, and a few steamers, to which were added vessels of high speed belonging to the Russian Company. The latter craft were armed with guns, furnished with torpedoes, and converted into a special type of vessel for active defence. Amongst them were the Emperor's yacht "Livadia," the "Elborous," the "Eriklike," the "Argonaute," the "Vesta," the "Grand Duke Constantine," the "Vladimir," the "Rossia," &c. The command of the whole naval force in the Black Sea was entrusted to Aide-de-Camp General Arkass, who, on May 22nd (N.S.), hoisted his flag on board the "Elborous," but Rear-Admiral Tchikatcheff (of the Emperor's Household) was charged to organize, with two *Popoffkas* and some small vessels, the defence of Odessa from the sea. Also, at the end of the year 1876, some steam launches and row-boats, and everything necessary to lay down lines of torpedoes, were sent from Cronstadt to Kischeneff for the Danube. The assistance of the Roumanian flotilla, which consisted of four steamers, viz., the "Stefano-al-Mare," "Romania," "Fould-jeroul," and "Rindourika," was counted on; as also was the use of small river steamboats belonging to private persons. Such were the resources against the formidable Turkish fleet which might appear in the Black Sea, and against the Turkish Danube flotilla.

The Russian ships which, at the time mentioned, were in foreign waters, were:—at New York, Rear-Admiral J. J. Boutakoff's division, composed of the "Svetland" frigate, under the command of His Imperial Highness the Grand Duke Alexis Alexandrovitch, the corvettes "Askold" and "Bogatyr," and the clipper "Kreicer"; at San Francisco, Rear-Admiral Pousino's division, composed of the

corvette "Bayan," the clippers "Vsadnik" and "Abrek," the schooners "Vostock," "Ermake," and "Toungouse," the sloop "Hornstai," and the transport "Japonetz." In the Mediterranean were, at Spezia, the armoured frigate "Petropaulosk," and at the Piræus, the schooner "Kelasom." The clipper "Haydamak" and the sloop "Morje" were on the coast of China. None of these vessels, dispersed through different seas, could take part in the present war.

The disproportion of force indicated above being such, the part played by the Russian seamen might seem to have been necessarily a passive one; however, it was not so. Boats with steam power and oars, provided with torpedoes, soon succeeded in attaining, by a series of brilliant exploits—on May 26th, under Doubasoff and Chestakoff; on June 20th, under Novikoff and Skridloff; and June 23rd, under Novikoff, Niloff, Arens, and others—an honourable place on the Danube, and in entirely paralyzing the Turkish flotilla, which was supposed to be so formidable. At the same time the few steamers of the active defence showed how ineffective was Hobart Pacha's blockade. On May 1st, at 10 P.M., the first attack with torpedoes was made at Batoum, by the ship "Grand Duke Constantine," under the command of Lieutenant (now Captain) Makaroff, and it was followed by a series of exploits which may be compared with those of the most brilliant period of any fleet.

It is absolutely impossible to enumerate all these exploits in a short article, and it will only be stated that, on the Danube, two armoured vessels and a steamer belonging to the Turks were blown up; the destruction of one of these, the armoured vessel "Loufti-Djeli," was due to the artillerymen of the land service. The Russians also took and repaired two armoured vessels, the "Nikopol" and "Sistova." The other ships of the Turkish flotilla, intimidated by the boldness of the torpedo attacks made by the Russians, kept at the small number of fortified places still occupied by the Turks, and did not venture to risk themselves on the waters of the wide river Danube. Such, on the Danube, were the chief results of the labours of the Russian seamen, who, since the early part of June, had been placed under the command of the former Captain of the "Svetland" frigate, His Imperial Highness the Grand Duke Alexis Alexandrovitch, who had returned from America on June 13th, and had almost immediately started for the Danube. On June 13th and 27th the Russian Army crossed the Danube at two points, at Brailoff and at Zimnitza near Sistova. From that moment the position of the small Russian flotilla on the Danube was assured, and there only remained for the sailors to complete what Doubasoff, Chestakoff, and others had begun.

In the Black Sea, as has been said above, the bold incursions of the torpedo boats began on May 13th, by an attack at Batoum. Subsequently there occurred: the expedition of June 10th to Sulina, under Pouchtchine and others; the expedition of July 15th and 21st, at Kilia and on the coast of Anatolia; the gallant action on July 23rd of the "Vesta," under the command of Lieutenant (now Captain of the 1st class, and Aide-de-Camp to the Emperor) Baranoff, with a

Turkish armoured vessel at Kustendje; the expedition of August 6th of the "Constantine" and "Eriklik" to Penderaclea; the passage by the flotilla and the *Popoffkas* of the mouth of the Kilia; the torpedo attack, on August 24th, at Soukhoum (ship "Constantine"); the reconnaissance of the "Livadia" at Varna and Kavarna; the transport on September 4th, by the steamers "Vesta" and "Vladimir," of the wounded from Hagre and Hagaoute to Novo-Rossinskoe; the attack of October 8th and 9th on Sulina, blowing up of the steamer "Sulina"; the capture of a Turkish transport loaded with troops on December 25th, by the steamer "Rossia," under the command of Captain Baranoff, formerly commanding the "Vesta"; and a further attack with torpedoes made by the "Constantine" at Batoum, on December 27th.

[The sum of the purely *naval* operations mentioned in the above account amounts to the following: the destruction of one armoured river gunboat and one steamer on the Danube by torpedoes; the recovery of two abandoned Turkish armoured gunboats on the same river; a running fight between the armed steamer "Vesta" and a Turkish armoured corvette; the capture of a troop-ship; one torpedo attack in which the "Sulina" steamer was blown up; and six torpedo expeditions which seem to have been without result, none being mentioned. The strength of the Russian Navy, at the end of 1877, is given in the "Statesman's Year Book for 1878," as

I. The Baltic Fleet, consisting of 137 men-of-war, of which 27 were armoured vessels and 44 unarmoured steamers; II, the Black Sea Fleet of 31 men-of-war, comprising 2 armoured vessels and 11 unarmoured steamers; besides, III, the Caspian; and, IV, the Siberian squadrons. The Imperial Navy was commanded by 80 Flag Officers, 201 Captains, 98 Commanders, 746 Lieutenants, and 129 Midshipmen, besides the navigating, engineer, and other branches; the number of men was 25,101 (*Almanach de Gotha*). The naval expenditure (ordinary) is 25,038,381 roubles, equal to 3,500,000*l*.] *Trans.*

THE MEDICAL DEPARTMENT IN THE FIELD.[1]

Professor Longmore is well known both in Europe and America as a writer and teacher of military surgery, he has contributed largely to the literature of the subject in the Army medical reports and elsewhere, his "Ophthalmic Manual," is well known by medical Officers as a valuable *aide-memoire*, his treatise on ambulances is perhaps one of the most exhaustive of its kind ever published, and having acted for our Government as a delegate on various occasions at foreign exhibi-

[1] "Gunshot Injuries, their History, Features, and Treatment," by Surgeon-General J. Longmore, C.B., F.R.C.S. London: Longmans, Green, and Co., 1877. Price 31*s.* 6*d.* Size 9″ × 6″ × 2″. Pp. 686. Weight 2 lbs. 15 ozs.

"Kriegs-Sanitäts Ordnung," von 10 Januar, 1878. Berlin: Mittler und Sohn. Price 5*s.* Size 9″ × 6″ × 1″. Pp. 611. Weight ¾ lb.

tions, he has had unusual opportunities for examining the equipment and organization of different continental armies. His latest work on gunshot injuries is a goodly sized volume. It must be looked upon as the outcome of more than a quarter of a century's constant study, and the ripe expression of opinions not lightly formed.

There is an idea abroad that there is nothing special in the knowledge that is required for the treatment of gunshot wounds. Professor Longmore is one of those who does not share this view, and he proves conclusively and in accordance with the dicta of such authorities as Baron Dupuytren and John Hunter, that the circumstances under which both surgeon and patient are placed during war are so widely different from what obtains in civil practice, that a careful special study and training in many subjects not required in civil life, is absolutely indispensable for those who are to be entrusted with the care of our soldiers in the field.

The work divides itself naturally into three parts; the first deals more especially with the history and treatment of gunshot wounds, the second with field hospital organization, and the last is statistical. There are eleven sections in the first part. The first two sections treat of gunshot injuries and the causes which influence their nature, character, and ultimate issues, and the means by which they are produced. The various destructive elements employed in warfare are fully described in these sections, and illustrations of the various projectiles help the reader to form a just estimate of their destroying powers, while the density, velocity, and heat in determining their effects on the human body are fully considered. The difference between the injuries caused by round and conoidal bullets is dwelt on, and the superior destructive effects of the latter especially on the bony system is graphically depicted, the true nature and cause of the so called wind contusions are explained, and what may be termed the superstition regarding the poisonous effects of gunshot wounds effectually disposed of.

Section three deals with the characteristics and distinguishing signs of gunshot wounds; it is sometimes important in medico-legal cases to ascertain in a bullet wound which is the wound respectively of inlet and exit, it is not always easy to decide this point, and the circumstances which may determine a difference in the guiding marks are fully detailed.

If there be one thing more important than another in insuring the successful treatment of gunshot injuries, it is a due appreciation of the conditions of the tracks in the different parts of the body, caused by the passage of various missiles; the subject has received the full discussion that it deserves. Under Section four are considered the primary symptoms, and complications of gunshot wounds under which heads come pain, shock, primary hæmorrhage, and the lodgment and concealment of foreign bodies. With regard to primary hæmorrhage there is no doubt but that cases of this nature requiring the application of a tourniquet on the battle-field very seldom come within the observation of the military surgeon. Professor Longmore deals very cautiously with the question, but the foregoing is the general experience of

military surgeons, and does not accord with the popular notion, which is widely spread, especially at the present time when so many persons are taught the means of affording aid to the wounded, the first idea seems to be, when there is hæmorrhage from a wound in the extremities, to immediately restrain the bleeding by a tourniquet improvised or otherwise placed on the main artery of the limb, quite forgetting that pressure exerted with a firm well applied pad on the wound will generally suffice for the control of the comparatively slight hæmorrhage that usually occurs. A misapplied tourniquet, under certain circumstances, may cause the greatest mischief. While alluding to this point it may be observed that in a circular issued from the American War Office in 1865, it is stated that "The dread of "primary hæmorrhage on the battle-field is confined to the inexperi-"enced."

Every military surgeon of experience in the field can call to mind the many cases he must have met with of the curious positions in which bullets have been lodged, and the strange foreign bodies carried with them into the body, and what difficulties they have caused, the patient himself ofttimes unconsciously deceiving the surgeon; the latter will also recollect the multiplicity of wounds made by one missile, and which sometimes is not a little puzzling.

In Section five Professor Longmore dwells on the information that may be derived from a minute examination of the clothing and the bullet. There are sometimes doubtful cases which require for their solution all the skill, experience, and jurisprudence element in the mind of the surgeon, and a typical case is narrated, namely, where the position of a single hair, rightly interpreted, drew the quick-witted surgeon to infer that a bullet was lodged in a certain position in the forehead, the inference was correct. The bullet was extracted, and, still better, the patient recovered, when his case appeared almost hopeless, and he afterwards was able to perform his duties as a cavalry soldier.

In the sixth section all the secondary complications of gunshot injuries are fully treated, such as those fell diseases of war hospitals, hospital gangrene, pyæmia, and tetanus. These are the great enemies of the military surgeon, and too often nullify all his laborious exertions for the wounded. The complication known as secondary hæmorrhage, the invasion of wounds by maggots, erysipelas, and traumatic delirium receive their due share of notice.

The general treatment of gunshot wounds occupies the eighth section. In this, as well as in the seven preceding sections, the student will find full and satisfactory information, consult them on what subjects he will, in connection with the principles of military surgery. Cases are given which bring each point forcibly home to the mind and impresses it on the memory, which is still further aided by many well-executed illustrations. Injuries incidental to special tissues of the body and their treatment are not included, but will, we learn from the preface, form a separate treatise, to be issued on a future occasion.

Any lingering doubt that might yet exist regarding the inapplicability of the regimental system for modern warfare must be dispelled by the

perusal of the second part of Professor Longmore's work, especially when studied in conjunction with the Field Hospital Regulations issued with Army Circulars, 1st January, 1878, in which the duty and responsibility of each one concerned is detailed and full information given regarding the *personnel* and the equipment apportioned to regiments and to the bearer column, and field hospitals of an army corps, and the method of packing the various waggons. It is very satisfactory to hear that the latter with their equipment, surgical and otherwise, are not merely on paper, but that the waggons are actually built, and the contents ready to be packed at a moment's notice. It is well known that all the surgical equipment, with the exception of perishable stores, is kept in readiness in Germany for each army corps at its headquarters. We have been behindhand hitherto in this matter, but now this is all changed, and no past time has seen the Army Medical Department, as regards equipment, better prepared for eventualities than it is at present, from the first dressing which is required for the soldier on the field to the arrangement for the hospital ships that will bear him sick or wounded to his home. It is to be noticed that, although the organization is very similar to the Germans, which proved so successful in the Franco-German War of 1870–71, the German model has not been slavishly followed. The duties of the respective Officers of our bearer companies and field hospitals are arranged on a much simpler plan, and more in consonance with the English service.

On referring to the most recent German regulations regarding the sanitary detachment, the analogue of our bearer company, it appears that the former is still commanded by a combatant Officer; this is a decided mistake; it leads to no end of jealousy, and, in our experience, is a source of inefficiency; to place a combatant Officer in command of a detachment of medical Officers and their subordinates employed in purely surgical work, is to place him in an anomalous position, and is a blot on the otherwise excellent medical organization of the Germans. This will be fully apparent to any one who reads the elaborate regulations concerning the respective responsibilities of the combatant Officer and the chief surgeon in a sanitary detachment. Divided authority means failure. What makes the German system to appear more inconsistent on this point is, that the Overstabsartz, or Surgeon-Major, in charge of a field hospital is the commanding Officer; and how well the field hospitals of the German Army did their work in the war of 1870–71 is a matter of history. In the Austro-Prussian War of 1866 there was a combatant Officer in charge of each field hospital, but the system worked so badly that it was altered after that campaign.

There was in our Service a tradition, now happily passing away, that a good medical Officer was unfit for anything except purely professional work, and the better the surgeon the less fit he was to undertake any other duty. Men of all professions, excepting of course the clergy, and from all ranks possessing the necessary capacity and education, were considered fit to command volunteers. The Commissariat Department could exercise the necessary authority over their men; the Medical Department alone was denied this privilege. The more enlightened system that now obtains is to make the medical

Officer responsible; there is now no go-between him and the hospital servants acting under him; he is at length unfettered in the discharge of his duties in his hospital, with his bearer company, or when he is doing duty with a regiment. A further relief has been afforded: by the new organization the medical Officer is not hampered by the charge of stores; these are drawn and accounted for by the Officers of the Army Hospital Corps, the medical Officer seeing that they are according to regulations, and kept in good order; thus he will be able to attend to his professional duties, and superintend the Army Hospital Corps in theirs, without his time being frittered away in quartermaster's and accountant's work, and with a corresponding gain to the soldier, the public, and himself. To secure the success of this new organization, the Service must have a class of medical Officers of high ability, recruited from good men from our best schools.

What the qualifications of a military surgeon should be are graphically described by Professor Longmore in the following abstract, which must be given *in extenso*:—

"The Army medical Officers require various qualifications to enable "them to discharge their functions in a satisfactory manner. The "executive medical Officer should be prepared to practise all branches "of medicine and surgery. The special divisions of surgical and "medical science, and the particular applications to certain subjects, "to which practitioners in civil life devote themselves, are altogether "inadmissible in military practice. The Army surgeon must compre-"hend in his range the whole sphere of professional science and "practice. He must, in addition, possess a variety of other know-"ledge peculiar to army practice, in order to be a thoroughly efficient "Officer. He ought to be acquainted with the science and application "of hygiene as regards bodies of men in all climates, the preparation "of various technical returns and reports, and the nature and uses of "all the articles comprised under the general terms of field, medical, "surgical, and transport equipment. The Army Regulations bearing "upon the management of patients in general hospitals and on field "service, and those upon his own relations to other Officers and other "departments of the military service, should be all familiar to him. "Certain physical qualifications are also of essential importance to the "Army surgeon. He should have a healthy and robust constitution, in "order to resist effectually the exposure and various trying circum-"stances incidental to military life in general, and especially to cam-"paigning. Moral qualities, to ensure him due respect from those "with whom he is associated, and to procure the esteem and confidence "of the troops placed in his charge, should also not be wanting. The "administrative medical Officers should have passed through the "grades of executive Officers, and should have proved their superiority "by the possession of special scientific, moral, and physical qualifica-"tions while in those grades. In addition, the Officers selected for "administrative appointments should have shown themselves prudent, "sagacious, capable of dealing with sudden emergencies promptly, "and thoroughly imbued with habits of military discipline. It is "equally true of medical as of combatant Officers, those who have

"conducted themselves best in subordinate positions will almost "always conduct themselves best also when placed in superior posi- "tions. Circumspection, the ability and decision of character which "will impress the higher military authorities with respect for opinions "and advice; the administrative tact, in addition, which will procure "willing obedience and excite professional zeal among the executive "Officers and departmental functionaries under their administration; "these are the qualities which will mark the most successful adminis- "trative Officer of the Army medical service."

It would be foreign to this review to detail a scheme which, if adopted, would hold out sufficient inducements for candidates who would in due course develop into the typical military surgeon just sketched, but it may be mentioned that it is a question, in a great measure, of expense; and the Government will have to authorise the additional necessary expenditure if it be alive to the necessity of procuring the best medical assistance for the soldier in peace and war; it would be unwise to have a large establishment of medical Officers that would clog promotion in peace time, and be a needless expense to the nation. A comparatively small and well paid department, with a reserve, is what is required. The department can no more meet the exigencies of war of its particular branch without a reliable reserve than the Regular Army to which it belongs can do so without the Auxiliary Forces. How is this reserve to be formed? Obviously by medical Officers who have retired from the department; early retirement, with an adequate allowance, allows of a healthy flow of promotion; it kills hope in the best medical Officer that ever served his country if you cannot give him a hope of promotion to the administrative grades after 20 years' service; in fact, every year after 40 years of age passed in the executive rank renders him the less eligible to become an administrative Officer; if it be impossible to promote him, give him a sufficient inducement to retire and pass into the reserve. The Officers composing the latter, in peace time would be eligible to hold certain appointments connected with the Service, and in war time they would take charge of our districts and hospitals at home, thus completely freeing the active list for services abroad. The department would with such a good backbone be easily and satisfactorily supplemented by young surgeons desirous of being temporarily employed in the field before settling down to the practice of their profession, by affiliated Red Cross Societies, by medical Officers of Militia, by volunteer medical Officers, who would undertake the duties of Army medical Officers in station hospitals, and latterly these gentlemen have evinced a most patriotic zeal in qualifying themselves for their military duties.

In an illustration on page 463, Professor Longmore shows the relative position of the sick bearers immediately behind the fighting line, the station of first help, the collecting station for transfer to ambulance waggons, from which the wounded are consigned to the dressing station, and from thence to the field hospital. The sketch saves a world of description, and impresses the system indelibly on the mind. In the first line of assistance there is a noteworthy difference between

the German organization and our own. Every German battalion and regiment of cavalry has what is termed a medicine two-wheeled cart, with two boxes placed *dos-à-dos*, containing a few medicines, bandages, and other surgical appliances; and the regimental orderlies have knapsacks opening behind, containing materials for first dressings; these can be obtained by the surgeon, if necessary, without the orderly taking the pack off. Stretchers jointed in the centre, so as to admit of folding, are carried on the cart which follows immediately in rear of the battalion. With us there are two field-companions for each regiment, and the stretchers, one for each company, are carried on the regimental transport waggon. The Germans lay considerable stress on regimental bandaging-places and the activity of regimental surgeons with bearer companies, while we rather insist on the regimental surgeon not undertaking any work that could possibly prevent their keeping up with their corps. Although the Germans are so amply provided for regimental assistance, on the other hand it has been repeatedly stated by the most competent authorities that the British field-companion is the most perfect equipment of its size for temporary regimental assistance; and the lately-introduced field-case of instruments, with chloroform, &c., weighing only four pounds and a half, amply provides for any operation which cannot be delayed. The case can be easily carried by every medical Officer doing duty with a regiment, either slung from the shoulder, or still better attached by D's from the saddle. Our weak point is that the stretchers have to be taken before an action from the regimental transport waggon, which may be some distance away, but this could not be avoided in the absence of a regimental surgical cart. In our field hospital regulations a provision is made for the supply of medical equipment in case of a brigade or one or two regiments being detached for duty away from the division where there might be a difficulty of a section of the bearer company acting. A distinguished Surgeon-General of the German Army considers our field panniers as the very best equipment ever designed, for such a purpose it would indeed be impossible to devise anything better.

In modern warfare the duties of medical Officers in charge of corps, whether on the line of march or in camp or quarters, are chiefly sanitary; and very important these duties are in keeping the troops in a good hygienic condition. In an action, especially a hotly-contested one, a great deal depends on the activity of the bearer companies; the medical Officers belonging to them should be young, active, and able to withstand any amount of fatigue, and two or three in each company should be expert operators. The prospects of ultimate recovery of wounded depend, in a great measure, on the skilful performance of operations that admit of no delay, the sustenance afforded immediately after an action, and the rapidity of transfer to the field hospitals in the rear; the carrying out of these duties all appertain to the bearer companies. The terrible thirst of the wounded has not been forgotten. Water tins are carried by the bearers; there are two water carts for each company, besides the water tank containing ten gallons below the floor of every ambulance waggon.

The qualifications of the Surgeon-Major in command of a bearer company are thus summed up by Professor Longmore:—"The Surgeon-"Major in charge of a bearer company must be a disciplinarian, "active and strong, and a fearless rider. He should be gifted with "tact, discretion, and knowledge of character, that he may judiciously "guide and control the varied *personnel* concerned with his charge. "He should have a quick perception of the leading features of ground, "and some acquaintance with military exigencies, in order to dispose "of his bearers, and to establish the dressing stations with the best "advantage."

With regard to equitation, every medical Officer—no matter what his rank or position may be—should be a good horseman; medical Officers now undergo a course of instruction in horse-riding; in this, as indeed in all other matters appertaining to their new duties, medical Officers are extremely anxious to qualify themselves, by attendance at the course now so successfully carried out at Aldershot.

The Germans even in their new medical regulations direct that the first field dressing should be carried, according to the corps, in the breast pocket, the trousers, or the back pocket of the tunic; why not always secure it to the inside of the tunic on left side of the chest? Charpie has not yet been discarded by the Germans as one of the constituents of the dressing; when it is considered from what and how charpie is prepared, it must be considered as most objectionable. Professor Esmarch, in his proposed first dressing, has substituted cotton wool.

On page 505 of Professor Longmore's book, there is a drawing of an orderly with pouches containing a few medicines, and a bag of dressing materials, attached to the waist-belt in front. This arrangement has been found inconvenient when an orderly is employed in carrying wounded, and in the new regulations it will be seen that a waterproof haversack, with the necessary surgical equipment, has been substituted; it is suspended by means of a broad woven belt from the right shoulder.

The Germans have introduced a novelty regarding the cards to be attached to the wounded (corresponding with our diagnosis tickets); white tickets are used for those who require immediate treatment in the field hospitals, and red for those who, from the nature of their wounds, are capable of bearing, without injury, further transport to the rear; it is also to be noted that the regimental bearers no longer wear the Geneva badge, but are distinguished by a red band encircling the left upper arm, as in future, during an engagement, the British Army Medical Department would be at once recognised by the Geneva badge on the left arm, there will no longer exist any necessity for medical Officers to be marked by funereal trappings in order that they may be distinguished from other officers.

German medical Officers wear the *pickel-haube*, the usual head-dress of the Army; for instance, the Surgeon-General of an army wears precisely the same helmet as a General Officer, and indeed may rank as a Lieutenant-General—a rank not as yet accorded to medical Officers in our service.

A very necessary step will be for medical Officers, the Army Hospital Corps, and sick bearers, to be clothed in the same uniform; the absurdity of having a department, when appearing on parade, clad in two if not three different kinds of dress, has been very apparent, and has given rise to much comment; further, as the department is now a consolidated body, it should bear a name that will include all its component parts.

A great boon given to medical Officers in the field is, that they are all to be mounted; it is absolutely necessary that a horse and saddlery should be provided. An unmounted medical Officer will soon break down in a campaign.

With regard to the conveyance of wounded by bearer companies, we have the mule litters and cacolets, so suitable for the mountainous warfare that England is so often engaged in. The ten ambulance waggons of the first line, with each of the bearer companies, will always be of service pattern, so indeed should the twenty-three of the second line be, and for very obvious reasons; the latest made ambulance waggons are very elaborate and of beautiful workmanship, but their weight appears to be very great, 18 cwt. against 13 cwt. of the old pattern; the latter waggons were equirotal, the fore wheels in the new ambulance waggon turn underneath the waggon, and it is a decided advantage their doing so; but they are considered by some to be too small, and therefore apt to stick in mud; there is one point very certain, that two horses will never be able to drag the waggon any considerable distance when filled with wounded on heavy roads.

All English field stretchers are now made with rollers of gun-metal attached to the feet. This provision will obviate the necessity of transferring the wounded at the collecting station from one stretcher to another. The principle is a sound one, but the stretcher requires a better plan for securing the stability of the legs when under the rough usage it must necessarily meet with in the field. The traverses are cumbersome and unnecessarily heavy.

The Germans have considerably improved their ambulance waggons. Since the war of 1871–72 the huge leathern coupé has been discarded, the front and hind wheels are nearer to one another, thus improving the draught. It would be interesting to ascertain what the weight is, and compare it with that of the English waggon. It is drawn by two horses.

The two-wheeled stretcher, shown on page 539 of Professor Longmore's work, is a capital hand vehicle for police and railway stations for conveyance in cases of accident. Although carried on the roofs of many ambulance waggons by the Prussians, we do not remember a single instance in which they were used through the Franco-German War. The only place that the wheeled stretcher can possibly be of any use in the field is at a base hospital, and that only seldom. Unlike the Germans we have no special surgery waggon with compartments for the bearer companies; with us the necessary surgical appliances are contained in light panniers of special make—wicker-work covered with hide—which have rollers of gun-metal underneath,

and are carried with an operating table and tent in a very light four-wheeled spring waggon—two-horsed. There is also in the panniers, besides surgical material, a few cooking utensils, and means of affording temporary sustenance to the wounded after an action. In less than two minutes all the panniers can be taken from the waggon, and arranged in proper form at the dressing station. The contents of the waggon weigh about 14 cwt.

Taking into consideration the great difficulty that exists of affording sufficient sustenance to the wounded after a battle, there is one improvement in the equipment of a bearer company which suggests itself, namely, that it would be well if the space occupied by cooking utensils was given up to additional medical comforts, other means of cooking being provided; and nothing appears so adapted for this purpose as the Swedish two-wheeled cooking cart, which was used in the Roumanian field hospitals at the siege of Plevna, by means of which food was prepared for many thousand sick and wounded Turks after the surrender of that town; the extreme facility of cooking extemporaneously by means of this cart is well known, and though objections will be raised as regards the multiplying of carriages with the necessary drivers and horses, still the end in view is so important that it should counterbalance other considerations.

The proper method of carrying wounded has been detailed with the greatest minuteness by Professor Longmore; our sick bearers being obtained from the Reserve, and, therefore, being already drilled soldiers, from four to five weeks is only required to make them perfect in their bearer company duties.

Leaving the bearer companies we come to the second line of assistance—the twelve field hospitals moving with an army corps, two attached to each division, two to corps troops, and the remainder in reserve. Both the Germans and ourselves have special pharmacy waggons for field hospitals. The English pattern (two for each hospital) is admirably and ingeniously fitted; if it has a fault it is that it is almost too elaborate for the second line of assistance. The waggon has also been considered to be rather heavy, but a field hospital is not moved every day, and this fact meets the difficulty. The utensils in the four field hospital store waggons, belonging to each hospital, could scarcely be reduced in number without sacrificing efficiency, and the equipment has been exceedingly well chosen.

The tentage accommodation for patients in each field hospital consist of fifty circular tents with higher walls than the ordinary bell tents, each tent accommodating four men. These tents have, no doubt, been chosen, not because they are the most suitable shelter for the sick and wounded, but because they are the best available pattern for movable field hospitals; they possess a decided advantage in the ease with which they can be pitched and struck, besides the tentage accommodation can be readily measured according to the requirements of the wounded, and segregation easily obtained for infectious cases.

The thirteen stationary field hospitals along the lines of communication and at the base of operation, constituting the third line of assistance, have no special waggons; but the equipment would be

essentially of the same kind as for movable hospitals, except that hospital clothing and other articles could be supplied in much larger quantities, as there would be no restriction on account of construction or number of waggons.

In these stationary hospitals it is directed that hospital marquees are to be used when buildings and huts are not available. The English hospital marquee is noted for its comfort, and the great protection it affords against the weather. The drawbacks are its great bulk and weight. By far the best hospital tent, combining stability with comfort, lightness, and cheapness, appears to be the Austrian marquee, which proved of the greatest value during the inclement weather in the East in the Russo-Turkish War.

The German hospital tent, in their new regulations, is of the same pattern as in the old; with its iron rods, curtains, and other complications, it must be exceedingly heavy, difficult to pitch, and, if any of the ironwork be broken, the tent must be rendered useless. In the Franco-German War, it was never used in the active operations in the front.

A suitable bedstead for the sick and wounded in the field is evidently a problem not easily solved. The Germans gave directions for making simple bedsteads from planking and lengths of wood, and constructed according to the plans given; they were of great service in 1873-74, in Orleans, Meung, Le Mans, Chartres, and other towns where stationary hospitals were established, and, being inexpensive, medical Officers had no compunction in converting them into firewood, after being occupied by infectious cases.

A capital bed for field hospitals consists of canvas sacking stretched between two poles and stuffed with straw or hay, the ends of the poles pass through holes in a wooden crossbar, supported on two stout legs, eighteen inches high; the crossbar and legs are all in one piece. All these stretchers being similar in construction, if a component part be lost, there is no difficulty in supplying the deficiency.

These bedsteads were used for weeks together in the field, in cases of severe diseases and serious operations during the Eastern War, and most comfortable accommodation they afforded for the sick and wounded. It is to be noted that, by a simple arrangement in the sacking, an excellent pillow could be formed.

Hospital railway waggons bear the same relation to a continental Army as hospital ships do to our Service, and in the German regulations the fitting equipment, *personnel*, and conduct of these sanitary trains, as they are called, are fully entered into, and plans of the waggons for cooking and conveyance of the sick are given; with us, the transport by rail would be amply provided for by extemporised means, as in the well-known Zavodovsky system in the East. During the war, ordinary trains were easily fitted up with what was required, and they answered exceedingly well on short journeys, a provision for which would only be required by an English force landing on the Continent. As to our hospital ships, one of which is appointed for each division, with a store ship attached, nothing need be said further than that a reference to the Army Medical Reports will show how excellent, of

late years, all arrangements under this head have been, and as Professor Longmore has justly remarked, the well-known "Victor "Emanuel" will in future be the type of our hospital ships.

Seventy-five pages of the new German regulations are devoted to sanitary service in the field—food, water, clothing, care of the troops on the march, in cantonments, quarters in hospital, on railways, and on the field of battle—are treated, while guiding directions are given with regard to the prevention and spread of Army diseases, including the mode of disinfecting, the erection and appropriation of tents and huts for the sick and wounded, as well as ready methods for the analysis of water in the field; all these subjects are very carefully worked out. They are familiar to everyone who has gone through the course at Netley, and any information not detailed in our sanitary regulations will be found in that literary mine of sanitary science—the work of the great apostle of modern military hygiene—the late and revered Professor Parkes. The tenth section of Professor Longmore's book deals with the classification of gunshot wounds, and the eleventh or last is statistical. Statistics on gunshot wounds are like statistics on many other subjects, they are interesting on many points to the student, but are not of much assistance as forming the basis of a system. Every campaign, nay, every engagement, has its own peculiar features, which modify the number of killed and wounded, the nature of the wounds, and the part of the body which will suffer most; for instance, no two tables given will, when compared, show the relative destructive effects of the round and conoidal bullet, although we are aware, of course, that the latter is the more destructive missile of the two.

Imperfect as the foregoing review may be, it must end here, as the limits assigned have already been transgressed, but it is hoped that enough has been written to show that we are keeping pace with the increased requirements of the sick and wounded in modern warfare, and in some respects, indeed, are in advance of continental nations. What adds immensely to the difficulty in making suitable provision in our case is that England must be prepared for war in any quarter of the globe, where her world-wide interests require it.

Day by day, step by step, for the last four years, improvements have been made, and are still progressing under the present Army medical administration; there has been no swerving from the object ever kept in view, namely, the efficiency of the department, and it is a heartfelt wish that the day is not far off when the medical Officer, ever present with the soldier in health, in disease, on the field of battle, and in all climates, will belong to a united, contented, and much sought-after service, which, with its reserve, will be linked with militia and volunteer medical Officers, thus constituting a medical force that will be equal to any contingency, should England unhappily be engaged in a great war.

RUSSIAN TORPEDOES ON THE DANUBE AT SULINA, AND AT BATOUM.

Translated from the *Revue Maritime et Coloniale*, April, 1878, by Lieut. J. MERYON, R.N.

THE Russians have until now employed spar, towing, and locomotive torpedoes with varying success.

We shall describe, from their own reports, the acts of war in which these engines have been called into play; but we should have wished to have also had the Turkish reports, in order to compare the two versions and to better understand the causes of the results. At the same time, the affair at Seifé appears so clear in the Russian reports that we can but think it occurred pretty nearly as described by Lieutenant Doubasoff and the newspapers of his country. We have carefully collected all the technical accounts, but they are often wanting in details.

1*st. Night affair of the* 12*th*–13*th May*, 1877.

The first attack which the Russians undertook with torpedoes against the Turkish fleet took place on the night of the 12th–13th May, at Batoum.

They had armed, for this purpose, a ship of the Maritime Company of Odessa. This was the "Grand Duke Constantine," which we shall frequently hear of again during this war, where she was commanded by Lieutenant (*Lieutenant de vaisseau*) Makaroff, soon after promoted to Commander (*Capitain-Lieutenant*).

The "Constantine" was an iron screw steamer, of moderate value. She did not steam more than 10 knots an hour; her crew consisted of 150 men and 4 Officers, without counting the pilot, engineer, and doctor. Armed with torpedoes and four 4-pounders, she was arranged to hoist to her davits four fast torpedo-boats—the "Tchesmé," "Sinope," "Navarino," and the "Soukhum Kalé." The "Constantine" left the anchorage of Sebastopol on the evening of the 10th of May, with the intention of blowing up some Turkish men-of-war at Batoum. Makaroff, in his enterprise, boldly hoped to avoid, during daylight, the Ottoman squadron, thinking that he would be able to see them before they could see him, owing to the thick smoke of the English coal used by his enemies; and, as he carried no lights, he counted, also, on avoiding them at night, since the Turks, manœuvring as a squadron, were obliged to carry them.

We shall hence see him three times able to deceive and surprise the enemy.

Arriving on the morning of the 12th in sight of land, the "Constantine" entered Poti at daybreak, and left this anchorage in the evening for Batoum. At 10 P.M. she was off the roadstead at seven miles distance. She dispatched her four boats, which were each commanded by an Officer, Makaroff himself taking charge of one of them.

These boats, well built, painted sea green, possess a high speed, obey their helms well, do not betray their approach, and, by their small size, are bad targets for artillery. When the boats left, it was agreed that the "Constantine" should not wait for them if they were observed before arriving at their destination, and that they should regain Poti to the best of their ability.

However, they arrived happily in the roads, and the "Tchesmé," commanded by Lientenant Zatzarennyi, which was two or three cables ahead of the others, first came across a Turkish ironclad frigate, which was stationed as guard ship. Zatzarennyi had a towing torpedo, which he was able to place right under the stern of the ironclad, but the explosion did not take place when the electric firing-key was pressed. It appeared that the wires were foul of the screw of the torpedo-boat, and that most probably some of the insulation was stripped off. The Turks, having at last taken the alarm, began firing from the shore and from the fleet, but the boats received no harm; however, two of them, of which Makaroff's was one, endeavoured to regain the "Constan-" tine." As to the "Tchesmé" and the "Sinope," they succeeded, after making several *détours*, in reaching Poti. Although this first endeavour was unsuccessful, the authors of it were received at Sebastopol with enthusiasm, when the "Constantine" returned there on the 15th May.

2nd. Night affair of the 25th-26th May.

In this extremely interesting affair, the Russian steam boats, armed with spar torpedoes, attacked a Turkish squadron of three ships, and sank one of them.

During the night of the 24th–25th May, Lieutenant Doubasoff anchored at Braila, made a reconnaissance, to assure himself of the relative positions of the Turkish ships—the "Fet-ul-Islam," the "Seifé," and the "Kilidj-Ali," an ordinary two-funnelled steamer. The distance from Brailoff to Matchin, as the crow flies, is seven or eight miles. One would think that the Turks were aware of Doubasoff's movement, since, although they did not take all the required precautions, yet they changed their anchorage on the evening of the 25th, and we shall see that they were not taken unawares.

The night of the 25th was rainy, but not completely dark, since the moon was above the horizon during nearly the whole of the expedition.

At one o'clock in the morning the Russian column left Brailoff; it was composed of four boats. 1st. The "Czarowitch," commanded by Doubasoff, who also commanded the expedition, with Major Roumain Mourjesko and 14 seamen. 2nd. The "Xénie," commanded by Lieutenant Chestakoff, with Lieutenant Petroff as a volunteer, and 9 seamen. 3rd. The "Djiquite," with Midshipman Persine and 8 seamen. 4th. The "Czarevna," Midshipman Bali and 9 seamen.

They left Brailoff in single column, in the above order, at 45 yards distance apart; they followed the coast until they saw the enemy through the mist, when they took the middle of the river, and took station in two columns, the "Czarowitch" and the "Xénie" ahead, the "Djiquite" and the "Czarevna" in the second line. They eased

speed at the same time, to stop, as much as possible, the noise of the engines and the water.

There was also a light wind from the north-west, which was towards the enemy, and might betray the approach of the Russians.

Before leaving, Doubasoff had arranged the following plan of attack. He was to attack first, Chestakoff to support him, Persine to pick them up, if they came to grief, and Bali to remain in reserve. If the first attack sunk one of the Turkish ships, Chestakoff was to attack the second, Persine would support him, Bali was to be ready to come to their aid, Doubasoff holding himself in reserve; and so on again.

The enemy presented themselves thus:—the "Seifé" in the middle, the "Fet-ul-Islam" on the right and ahead, and the "Kilidj-Ali" on the left. It was half-past two, the boats were going slowly, without any noise, with the exception of Doubasoff's, which gave him much trouble. The waste steam goes either into the condenser, whence it feeds the boiler, or into the funnel to increase the draught, producing a well-known noise at each stroke of the engines; if they stopped the blast the noise ceased, but the pressure of steam fell rapidly; they were, therefore, obliged to stop the engines while the pressure was got up again, if they did not wish to make a noise.

Four times Doubasoff, who saw the enemy, was obliged to stop to avoid being heard; stemming the current, which is strong at this part of the river, he could but go very slowly; he had taken an hour and a half to do the eight miles which separated Brailoff from the scene of action. The pressure in his boilers, which should have been from 3 to 4 atmospheres (45 to 60 lbs.) fell to 2 atmospheres (30 lbs.) when the draught ceased.

At last, arriving at about 135 yards from the enemy, Doubasoff turned on his blast, stoked up his fires, and, warning Chestakoff that he was going to begin the attack, steered for the "Seifé."

At about 65 yards from this ship, the hail of the Turkish sentry was heard. "Seni Adam!" replied at all hazards Doubasoff, instead of "Sizgyn Adam!" (one of your men) which even would have been a wrong reply, for, to the Turkish hail, "Kymm dyv ô!" the proper answer is, "Janandji deil!" (I am not a stranger).

Doubasoff's reply had betrayed him; the Turks were on their guard, for the sentry fired his rifle, which was repeated from other parts of the neighbouring ships. The captain of the gun (9-in.) was smartly on his tube laniard, and three successive miss-fires were heard. Disorder spread over the "Seifé;" the men ran hurriedly on deck, firing here, there, and everywhere; the crews of the turret guns, which commanded the deck, rushed to their posts, and, during this time, Doubasoff's boat was approaching. Sixty yards are quickly passed over, though deducting the current, he was hardly steaming four knots an hour.

He steered for the port deck houses, so as to shelter himself from the fire of the after guns, as well as, as much as possible, from that of the turret guns, wishing by this to strike the screw and the rudder, in order to render the "Seifé" inactive, she being under steam.

"I directed," says he, "the blow of my torpedo, placed on a straight

"spar ahead of the boat, a little forward the port deck houses, that is, a "little nearer the centre of the ship. I ordered the automatic firing-"gear to be joined up, to have the firing-key in hand, and to be ready "to complete the circuit at an instant. The explosion followed the "automatic closing of the circuit, and the torpedo evidently struck the "vital parts near the keel, just ahead of the stern post. The shape of "the submerged part of the stern of the monitor evidently in-"creased the outrush of the column of water, and this column filled "the boat. A black column of smoke and *débris* raised itself to a "height of about 120 feet, the ruined scraps of the ship's fittings "falling into the boat attested that the gas had passed through the "bottom and decks of the ship."

The afterpart of the monitor had suffered considerably; her displacement began to change, and the crew collected forward.

At the same instant, on board the torpedo boat, Doubasoff believed that his own craft was sinking, and ordered the stokers to leave their posts, to come out from behind the shields, and to throw themselves into the water to get on board the "Djiquite." Luckily his coxswain, an old seaman, Kisloff, called out that the draught of water was not changing, that she was not sinking, and Doubasoff, told of his error, set his crew to work to bale out the water; went astern full speed, and ordered his bilge-pump to be set to work. The Turks, however, had got their turret guns into action, fired them, and poured on the boats a fire of musketry; if the "Seifé" was going down, it was evidently very slowly, for ten minutes after the first explosion, Doubasoff, who was trying to disengage himself, called to Chestakoff—"Chestakoff! "Come on!" It was time, for already the port turret gun had fired two shots, and it only wanted one lucky shot to sink the "Czarowitch" as well as the "Xénie." Chestakoff, steaming ahead at full speed, placed his torpedo nearly opposite and a little abaft the turret.

"Exploding his torpedo at will," said Doubasoff, "he placed it "apparently under the very keel of the 'Seifé,' and the torpedo, being "at a distance of 19½ feet from the stem of the boat, was just under "the centre of the beam of the ship. The result of the explosion was "an evolution of gas, as strong as in the previous case. We saw a "cabin door fall behind the stern of the 'Xénie.'" The monitor from then ceased her artillery fire; although sinking, she kept up her rifle fire. During this time, Doubasoff, who was occupied baling out water by hand, his pump not working, drifted down stream carried by the current. As to Chestakoff, his screw was foul in the wreck, and he had to clear himself along the whole length of the monitor, while his riflemen replied to the fire of the enemy almost within pistol shot. At last clear, Chestakoff, in his turn, let himself drift. The "Djiquite" received a bullet in her stern, which obliged her to run on shore to stop the leak; her screw got foul of the weeds, and she was some time before she could be got afloat.

Meanwhile the day was breaking, and even distant objects began to be visible, the fire of the two Turkish ships afloat increased; it was necessary to retire. Hence as soon as the four boats were in a condition to be managed, Doubasoff returned with them to Brailoff.

The Russians allowed to neither killed or wounded.

The affair lasted about twenty minutes. One may ask what the other two Turkish ships were doing; according to the Russian reports, they were both in a position to fire. They declare that the projectiles from the Turkish guns, firing from their decks, passed generally over their heads. It is probable that the alarm spread by the torpedoes exploding so close to these ships may well have hindered their movements, and that they were principally occupied with their own defence. Doubasoff thinks that there was bad feeling amongst the Turks. He praises the coolness and courage of his subordinates; he says that no cry was made, and that silence was observed and only interrupted by a ringing cheer when the monitor sank. By that time the boats ought to have been far enough away.

The Grand Duke Nicholas immediately decorated Doubasoff and Chestakoff with the 4th class of the Cross of Saint George. A seaman torpedoist, an engine-room artificer, and a stoker, received the insignia of the Order of Military Merit.

The two seamen who exploded the torpedoes had passed through the Russian torpedo school, and had served four months in the instruction ships "Izoumrood" and "Tcharodaika." The accounts in the European papers were very diverse. The *Standard* of the 28th May represented that floating torpedoes of dynamite had been placed across the stern of the monitor, and that the wires had been led to the shore, where they were brought together to pass the electric current. The same number gave another account more nearly approaching the truth. The *Times* of the 28th says that it was one of the bravest deeds in the history of the war. On the 4th June it pretended that the Russians were dressed as Turks, and had talked with them while placing the torpedoes.

Finally, Arifi Pacha, in a report to his Government, believed that the "Seifé" was sunk from the effect of two Whitehead torpedoes.

3rd. Night affair of 10th-11th June, at Sulina.

On the 28th June the Russian steamer "Grand Duke Constantine," commanded by Lieutenant Makaroff, left Odessa at 1 P.M. She had in tow, and hoisted up, six steam boats armed with torpedoes.

After her, the "Vladimir" left at seven in the evening to support her in case of necessity. The object of the expedition was not known until out of sight of land; when the boats were told that they had to blow up four Turkish ships, of which three were ironclads, anchored off the Sulina mouth. They were the "Fethi-Boulend," the "Idjalie," and the "Mouhadem-Khair" the fourth unarmoured was the "Kar-" tall." The Russian boats were divided into two groups. The first, which was towed, consisted of boats No. 1 and No. 2, and the "Tchesmé." The two first had spar torpedoes, and the third a towing torpedo. The No. 2 was a very large boat, 68 feet long. She was commanded by Lieutenant Rojdestvenski; the No. 1 was under the orders of Lieutenant Poustchine, and the "Tchesmé" under those of Lieutenant Zatzarennyi, who, the previous month, had directed near Batoum a torpedo attack against a Turkish frigate. The "Constantine" arrived before

midnight near the Isle of Serpents (Fidoniu) situated 26 miles east of the Kilia and Sulina mouths, remained there several hours, but not meeting, as she had hoped, the Turkish ironclads, continued her voyage towards Sulina; at half-past one, Makaroff stopped again, and gave the boats, in a loud voice, the following orders:—"We are six "miles from the Sulina Roads; let go the tow, and try to find the "Turkish ships. If, after going five miles, you see nothing, pass to "starboard off the Sulina lighthouse, and steer to the northward, five "miles from there you will meet me. Remember this agreement. "Do not separate until you see the enemy. God bless you!"

Letting go the tow, the first group formed line abreast, the boats keeping close together went ahead. The "Tchesmé" was in the middle. Boat No. 2 on her left, and No. 1 on her right. The working of the engines was scarcely heard, and all lights were carefully hidden with tarpaulins. After a few minutes the "Tchesmé" approached No. 2, and communicated to them, in low tones, that they had observed the enemy; she then went round to starboard, with the intention of working round the Turkish squadron, and of using her towing torpedo. Zatzarennyi got it in tow abaft his beam, but directly he began to go ahead, the conducting wires got foul of his screw; the engines stopped, and he only had time to manage to clear his propeller. It was a repetition of what had happened at Batoum; the failure of the "Tchesmé" and her fittings was evident.

Three of the Turkish ships were at anchor, with fires banked; the fourth was under weigh under steam. Lieutenants Rojdestvenski and Poustchine steered on with boats Nos. 1 and 2. The latter, which was a little ahead, steered towards her neighbour, and Poustchine said to his colleague, "Do you see a Turkish ship on the left?" On receiving an affirmative reply from Rojdestvenski, Poustchine sheered off and disappeared in the darkness. The Turkish squadron was plainly in sight, the sentries were heard challenging each other; however, the darkness was such that the "Idjalie" allowed boat No. 2 to approach within 30 yards of her before hailing and firing the first rifle shot, which raised the alarm in the other ships. These immediately commenced a general fire of artillery and musketry.

It was two o'clock in the morning. Rojdestvinski, who up till now had been steaming slowly, increased his speed so as to come up to the enemy quicker, arrived close to the beam of the "Idjalie," and when nearly touching, produced the automatic discharge of his torpedo, but it was difficult for him to judge of the result of his attack. From subsequent inquiries the "Idjalie" received probably some severe damages, but the Turks formally deny that she was placed out of action. That, however, appears to have been beyond doubt the case. It is always the case that an enormous sheaf of water is raised along the whole length of the ironclad, and falling into the boat fills the foremost compartment, where the steering gear is placed, with more than 3 feet of water. According to all accounts this wheel was near the midship part of the boat, to which its water-tight partitions afforded on this occasion good service, since this mass of water, changing the displacement of this large boat, and raising the stern,

probably permitted her more easily to clear the "crinoline" which was round the "Idjalie," as we shall see further on. At this instant the ironclad's guns opened fire, and her projectiles passed over the heads of the assailants.

The boat had at first gone astern at full speed, and, when clear of the beam, went ahead, when it was noted that the axle of the steering wheel was damaged, and that the stay was broken. To place the helm in a condition to be of use demanded all the coolness and pluck of Rojdestvenski and of the engineer, Kantzeroff, who had to come out from behind their shield, and work with their own hands to ship the fighting tiller, under a hail of bullets, whilst the seaman-torpedoist, Sokolnikoff, threw overboard the remains of the spar, and deliberately cut the wires. Besides this, a gauge glass had been broken by the explosion, and the funnel had been bent. At the same time, the Turkish ship under weigh steered towards the torpedo-boat, and threatened to chase her. Rojdestvenski's position was becoming embarrassing; bullets had pierced the sides of his boat; the pressure in the boiler had fallen; he reports that then his engineer threw 5 lbs. of salt and oakum into the fires, the pressure then immediately rose, and the Russian Lieutenant was able to rejoin the "Constantine." We think that the chase by the Turkish ship was not very seriously meant; the intense darkness, and the alarm which the unexpected attack of the Russians inspired, were not calculated to give great ardour to the pursuit.

The second group of the Russian torpedo-boats had followed up the first, but, on hearing the noise of the explosions, and perceiving that by this time the Turks were too fully alert to be surprised, they returned towards the "Constantine."

That ship, hearing the heavy gun and rifle fire, had attempted to close the land, but she grounded, and remained until daylight in a difficult position. Got afloat at last, after having thrown overboard some of her coal, she was able to pick up her boats and return to Odessa. Poustchine alone was missing. Makaroff waited for him until 8 A.M., but he was too inferior in strength to the Turks to remain longer near them. What had become of boat No. 1? The Russians were the more anxious, since they had heard a second explosion. Poustchine had come across a girdle of chains and hawsers, supported at intervals by barricoes. Charging this obstruction, he had even fired his torpedo, but with no effect. His boat, half filled with water from the explosion, was sunk by a Russian shot. In a moment, the Russians were all in the water, and Poustchine relates that he lost consciousness; when he regained it, he found himself in the hands of the Turks.

The ship which he had attacked had evidently a defensive crinoline. Rojdestvenski thinks, also, that the one with which he was engaged was similarly protected.

On the return to Odessa, he found, in fact, that his boat had a leak; and, when she was lifted, it was ascertained that she had, on the hull, in the bows, near the keel, sixteen rivets started or broken; in midships, marks of having been in contact with some hard substance;

and aft, that the iron keel-plate had dropped 46 centimetres (18 inches) from the keel; and finally, that the lower part of the rudder was broken, and that one of the blades of the screw was bent aft. All these damages are perfectly explained by a defensive crinoline, over which boat No. 2 had passed and repassed. It would also account for the damage to the steering wheel; although a doubt may remain, as these damages, at least those of the rivets, were perhaps the partial effect of the explosion of the torpedo. It is true that the explosion, according to the men in the boat, was feeble; from which it may be thought that the principal effect of the explosion was spent in the extended girdle of the monitor, which the facetious editor of the *Kronstadt Messenger* nicknamed her "crinoline." He also adds, with considerable sagacity, that the authors of this affair had not probably sufficient presence of mind to give an exact account of what took place.

The Russians allow to none killed.

We will also give some Turkish accounts of this affair:—

Telegram from Admiral Moustapha Pacha. 12th June.

"Five fast Russian torpedo boats sent to Kilia to attack the "'Idjalie,' and the other Turkish ships, were received with a storm of "bullets. Two boats were sunk, and the three others exploded their "torpedoes, but without effect on the fleet. Some Russians have "been made prisoners."

12th June.—Extract from the Official Turkish Report of the Attack on the "Idjalie."

"The explosion was ineffectual, owing to the clever manner of "handling the ironclad. We have taken prisoners six men of the "crew of the torpedo boats, and amongst them an Englishman (?)."

Rojdestvenski received the 4th class of the Cross of Saint George. Kantzeroff, Sokolnikoff, and another seaman, the insignia of the Order of Military Merit.

4th. Day affair of 20th June.

On the 20th June, at 3 A.M., six Russian steam boats anchored at Maliadedjesse, left that port to place torpedoes at six miles from there, in the channel of the Danube, which at this point follows the steep bank of the Turkish shore. The river is four miles broad, and is divided into several arms, by islands covered with rushes and willow trees. The Russians were told to place the torpedoes along the two sides of a small island, about 600 yards in length.

Up till daybreak they succeeded in placing their torpedoes on the Russian bank, but directly they tried to commence operations on the Turkish shore, they were saluted with a shower of balls, to which the Russian batteries, in their turn, replied. However, a Turkish steamer came out from Rustchuk and caught the boats between two fires, which, not being able either to advance or retire, took refuge amongst the rushes of the island, exposed to the fire of the enemy; this was increased by that of a monitor, which, protected by the island, continued

the fire from its bank against the Russian batteries. It was then 8 A.M., when Captain Novikoff ordered Lieutenant Skrydloff to stop, at all hazards, the progress of the steamer. This Officer commanded the boat "Choutka," which carried a torpedo. Immediately he left the rushes at high speed, ran under a heavy artillery and rifle fire, struck with his spar the broadside of the ironclad; unhappily, the torpedo did not explode, and they found that the wires had been cut by bullets in two places. The fore part of the boat was struck by a shot, and the crew began baling out. Skrydloff succeeded in escaping, by making a large sweep down the river, and rejoined the Russian flotilla; he had been wounded in both legs, as well as a volunteer, an artist called Verechtckaguine. The engines, which were evidently protected, had received a volley of musketry, but none of the crew had been touched.

The fire continued all day; the losses of the Russians were insignificant, and they profess to have succeeded in placing their torpedoes.

Nevertheless, the repulse of the "Choutka" was complete. It is astonishing that she did not suffer more loss, and that she was able to escape the Turks; evidently their fire was bad, or this audacious attack, in broad daylight, could hardly have been so nearly successful. All things considered, I do not find a sufficient clearness in the Russian report of this affair; it seems to avoid telling the whole truth. I would not answer for it that Skrydloff was really in contact with the ironclad, although his report says that he was. Anyhow, it may be asked whether the Russians would have dared to make such an attack in the face of any other adversary than a Turkish man-of-war.

5th. Night affair of the 27th December.

Poti is a small Russian port, situated a few miles north of Batoum. By reason of the form of the coast, the movements of the ships in one of the ports could be seen from the other. Hence, since the Turkish ironclads and several steamers were at Batoum, the "Constantine" had been forbidden to anchor in Poti during the daytime. Hence, when the "Constantine" arrived at Poti on the 27th, from Sebastopol, with four torpedo-boats at her davits, night had already set in. They learnt that the Turkish ironclads had just bombarded the fort of Nicolas, and ought to have returned to Batoum, or would be found in the vicinity. Makaroff immediately got ready. The night was very dark; a fine rain was falling. The swell was very low, which is a great point for using locomotive torpedoes. When arrived within four or five miles from Batoum, the "Constantine" lowered her four torpedo-boats. They were—

1st. The "Tchesmé," with a Whitehead torpedo, charged with 32 kilog. of gun-cotton, commanded by Lieutenant Zatzarennyi, who had already been at the affair of Sulina, and the first Batoum affair, and had been decorated with the St. George's Cross;

2nd. The "Sinope," armed with a similar Whitehead torpedo, carried on a separate raft, under the orders of Lieutenant Stchelinski;

3rd. The "Souhkoum Kalé," commanded by Midshipman Nelnn-Hirs;

4th. The "Navarino," Lieutenant Vicknevetski.

The expedition was under the orders of Zatzarennyi. They left the "Constantine" at 10 P.M. Makaroff, fearing the set of the sea, had given them a course a little to windward; this they did not know, and, with the same idea, they steered yet more to windward of Batoum.

In short, it was only at midnight, after much groping about, that the boats sighted the masts of two ironclads over the long point of land which shelters the roadstead of Batoum. They rounded this point at slow speed, and found themselves in the bay.

It was owing to the night being so dark that they were enabled to approach so close without being noticed. The Russians only noticed two ships; in reality there were seven. They were moored with one anchor ahead, and their sterns hauled in to the shore; their position was not advantageous, since only one could open fire, and that only on one side; the dark mass of this one was alone open to the Russian attack, who could see behind her another, placed nearer in shore.

The Turks had taken no defensive precautions—no protection—no guard boats. The sentries called to each other by whistling, showing that they were not asleep, but hardly added to the security of the defence.

The Russian boats took this ironclad for the "Mahmoudié," which Hobart Pacha commanded, and their excitement was proportionally increased.

The "Tchesmé" and the "Sinope," being the best steamers, had gone ahead, leaving the other two in reserve; they thus arrived at a distance, estimated at from 50 to 65 yards, from the Turkish ironclad; the "Tchesmé" then fired her torpedo, the first Whitehead torpedo ever fired with an offensive object. It ran straight, leaving behind it a trail of phosphorescent foam, and struck the broadside of the ironclad between the fore and main masts.

Whilst the surprised Turks were rushing on deck and calling out, the "Sinope," in her turn, fired her Whitehead, which exploded under the enemy's stern.

The ironclad had already opened a fire of small arms, and then her broadside began to speak, but, fearing to strike their own people, they fired too high, and their shots passed over the heads of the Russians—an effect which we have noticed before.

The two boats had nothing to do but retire. They rounded the cape at high speed, the "Tchesmé," which was the best steamer, towing the "Sinope."

Before going further we will say that the result of these explosions is unknown; if it was followed by a considerable leak they were unable to beach the ironclad, because the coast at Batoum is too steep. Perhaps she was able to reach Constantinople in a sinking state. Anyway, it is evident how much more interesting from certain points of view the Turkish reports would be than the Russian. In this actual case, at a time when the merits of the Whitehead torpedo are being discussed, it would be of the greatest interest to know whether the Russian accounts are strictly correct, and if the plucky Officers who carried out the expedition were not deceived.

The two boats had scarcely gone a few cables before they perceived a steamer steering for Batoum. They naturally took her for a Turk, and had only just time to prepare their screw torpedoes (first pattern of a Whitehead torpedo). They were preparing to fire them when they heard the cry of a vigilant Russian look-out, "Who goes there?" and then recognized the "Constantine," who had come to the entrance to Batoum to look for them, and hoisted them up immediately. The reserve boats, "Navarino" and "Soukhoum Kalé," had also mistaken the "Constantine" for a Turk, and in view of this unexpected enemy had steered for Poti, where they arrived safely. The "Constantine" had made night signals to them, and waited for them until daybreak. During all this time the Turks did not move. Finally, Captain Makaroff sailed for Sebastopol, where he arrived on the morning of the 30th. His entry was greeted with loud cheers.

Captain Chardonneau, who is the author of these interesting accounts, concludes by remarking:

We think that these accounts, taken from official sources, well analysed, will be of interest to sailors. One of these recitals has been already partially published in the *Revue*, from an article in the *Times*. We have been able to correct it in some points, and to complete.

The sum total of these reports, however, does not mark any great progress on the torpedoes used in the American war.

We have not yet to hand the accounts of the same class of action which occurred between July and November, 1877, nor those of 1878, with which we have permission to compile similar accounts.

Note by the Translator.—Subsequent accounts do not verify the statements of the Russians, that the Whitehead torpedoes used at Batoum exploded, as they were both picked up on the beach afterwards.

THE COMBAT AT PLEVNA.[1]

CAPTAIN VON TROTHA has produced an exhaustive study of the operations round Plevna. Commencing with a description of the theatre of war he deals with the subject in thirteen sections, adding at the end of the greater number critical remarks. We have not space for more than the observations which form the last section of the pamphlet, but a careful examination of the whole will repay perusal, and will probably be found of considerable value to Officers who are still studying the operations of the late war. The translation has been made by Captain G. MacDonald, R.E. H.

1. *The Operations.*

It will never perhaps be clearly known what plan of operations the Russian autho-

[1] *Der Kampf um Plevna.* Taktische Studien von THILO VON TROTHA. Pamphlet. Berlin: Mittler und Sohn. 1878. Price 3/6. Size 9″ × 6″ × ½″. Pp. 172. Weight under 9 oz.

rities originally devised, certainly not for some time; but whatever the original programme was, it was only carried out up to the passage of the Danube.

The comparative ease with which the passage of that river was effected, and still more, Gourko's promptly taking advantage of the situation to make a rapid advance over the Balkans, impress on the hitherto extremely cautious and methodical conduct of the campaign a quite different, we may almost say a foolhardy, character; it gives us the impression that in the middle of July political considerations exercised a greater influence on the management of the campaign than those of a purely military nature.

An undervaluation of the foe (which was soon severely punished) led to a precipitate advance; successes, easily won, and more apparent than real, produced a complete intoxication, which represented to the excited fancy objects as attainable, which, with the available resources certainly were not, and the reckless pursuit of which might easily have led to the most serious consequences.

It is interesting to form a general representation of the course which events would probably have taken had the interlude of Plevna not taken place.

First. It is possible that the sudden appearance of the Russians south of the Balkans might have created such consternation in Constantinople that all further resistance would have been given up, and that the way for negotiations would have been opened, not possible under the circumstances without certain sacrifices on the part of the Turks.

If Turkey then made (a purely imaginary hypothesis) extensive concessions on the basis of the Berlin Memorandum, and placed the execution of the promised reforms, to some extent, in the hands of a European Commission, Russia would have been, in a manner, disarmed. The end for which she had drawn the sword would have been attained, though perhaps only in appearance; at this time her pacific assurances and protestations of unselfish humanity had not been washed away by countless streams of Russian blood; as yet the just claims of Russian national feeling might have been satisfied with certain concessions of a more apparent and formal than of a real and actual nature. In a word, the solution of the Oriental question, that bugbear of the peace of Europe, might have been again postponed for a longer or shorter period. But the events associated with the name of Plevna have done away with this possibility, and have rendered the long-threatened Oriental catastrophe almost unavoidable. Herein lies the great political importance of the conflict which raged for five months round Plevna.

But there remains another alternative to be considered. The war might have been continued after the Russian passage of the Balkans, and the Russians, carried away by the excitement of their easily won preliminary successes, might have removed their scene of action, with their (as was only later established) entirely insufficient forces, beyond the Balkans.

In that case, the repulse would have taken place at Sophia or Adrianople instead of at Plevna. In view of the entirely insufficient Russian forces, and of the defensive strength of Turkey, so greatly undervalued, and in reality far surpassing all expectations, a repulse was unavoidable (quite apart from the numerous individual mistakes of the Russian leaders, which, however, were counterbalanced by at least equally serious errors on the Turkish side). This crisis would have had to be overcome, and the war in a measure started afresh. The Russians at Plevna found this difficult enough, and it cost them heavy sacrifices in money and blood, but with much longer lines of communication, and particularly with the difficult passes of the Balkans behind them, it would naturally have been far harder. It would then have been very possible that the campaign of the year 1877 might have closed with a manifest reverse to the Russian arms.

The great strategical result of the fighting round Plevna is that it opened the eyes of the Russians in time to the dangers which threatened them; that it compelled them to make in time a suitable change of their entire plan of campaign, and that it finally forced them, against their will, in a measure, to raise the additional troops which were quite indispensable for a decisive result.

From these considerations it might be readily concluded, that as the campaign before Plevna, in spite of preliminary reverses to the Russian cause, yet eventually was productive of important advantages, and in a manner could not fail to produce

such; it must have been an error on the part of the Turks to bring on a decisive battle at Plevna. This point requires a brief consideration.

The strategical position of the Russian Army, when Osman Pacha appeared so suddenly on its right flank, was, without doubt, unfavourable, and when Krüdener was beaten at Plevna on the 30th of July, it became in a high degree critical.

Had Osman Pacha been in a condition, immediately after this victory, to undertake an energetic pursuit, and to drive the demoralized as well as defeated troops of Krüdener back over the Osma, which, according to the numerical strength of the two armies, he would have been quite capable of doing; all the requisite conditions would have been presented (assuming a tolerably judicious and combined employment of the southern and eastern Turkish armies) for bringing on the Russian armies a catastrophe which would have certainly decided the issue of the campaign for the year.

In this case, the original retention of the Western Army at Widdin, and its skilfully managed advance at the decisive moment, on the decisive point, would have been adduced, with a certain degree of justice, as a splendidly conceived and brilliantly successful example of strategical calculation, and the much despised and opposed "secret plan" of old Abdul Kerim (the existence of which even has been often doubted) would have found a striking justification. But this justification—the regarding of the advance of the West Bulgarian Army from Widdin to Plevna as the outcome of deep strategical reflection—is much shattered, not by the eventual want of success—this would be an unworthy criticism—but by another consideration.

If Osman's Army was to play the decisive part which we have attributed to it, this could only be done by an energetic offensive; but Osman's inactivity, after his second victory at Plevna, on the 30th of July, proves that his Army, which had behaved so well on the defensive, was entirely wanting in any trace of offensive power; otherwise an undeniably skilful General, like Osman Pacha, would never have failed to take advantage of such a favourable state of affairs as was presented to him in the beginning of August.

If Osman Pacha considered himself, *i.e.*, his Army, capable of carrying on energetically the offensive movement he had begun, up to a decisive battle, then his advance from Widdin to Plevna was a well planned operation; but if he did not give his Army credit for such offensive power, his advance was a mistake. The simple holding fast of his Army to Plevna was then, in spite of all his defensive successes (partly due to the unskilfulness of the Russian leadership) not only aimless, but a voluntarily surrendered advantage to the Russians; that they did not make use of this advantage till late and after many failures and sacrifices—even that the obstinate holding out of the Turks at Plevna nearly gave to the whole campaign a turning unfavourable to the Russians—all this lay in circumstances which were quite without the foreknowledge of Osman Pacha.

2. *The Fighting. Fire of Masses. Entrenchments.*

The great wars of the seventeenth and eighteenth centuries bear in a certain degree a personal character; almost every one has its peculiar character, as far as it has one stamped on it by the individuality of one or several leaders. Of course, in course of time a succession of progressive steps have been made, partly in technical armament and equipment, partly in tactical formations and the employment of troops: but important innovations, influencing the entire mode of combat, do not appear, and so during a long period the mode of fighting remains fundamentally unchanged.

The period of the Napoleonic wars forms the transition from the above-mentioned epoch to that of modern warfare. Certainly the appearance of the dispersed order of fighting exercises a revolutionary influence on the general mode of combat; but the arms and equipment of the infantry, cavalry, and artillery of Napoleon differed in nothing from the arms and equipment of his opponents, and apart from comparatively unimportant minutiæ, hardly from the arms of the time of Frederick, of Eugene, of Turenne.

The great wars of the last five-and-twenty years present an essentially different picture; the individuality of the leader, though naturally now as formerly decisive

of the result of the war, retires far into the background as compared with former times. On the other hand, each great war of late years is characterized by an epoch-forming step of progress in the region of armament, and by a consequent fundamental alteration in tactics.

The war of the East brought the rifled musket, the Italian War the rifled cannon, the American War armoured ships and monitors, the Prusso-Austrian War the breech-loader with moderate range and rapidity of loading, the Franco-German War the Chassepot as a far superior rival of the old breech-loader; finally, the Russo-Turkish War produced new systems outbidding each other in rapidity of fire and range, and culminating in the repeating rifle, and in connection with them the application of field fortifications on a large scale, no longer as an exception, but as a rule.

The danger of a waste of ammunition deduced as an objection by the opponents of the breech-loading system on its introduction, was happily overcome by the fire-discipline of the Prussian troops; the strikingly small expenditure of cartridges in 1866 (2,000,000) gave evident proof that the rapidity of fire of the new arm was only made use of in rare exceptional cases, and then only partially: the fire was generally delivered as aimed fire at short distances, and with very moderate rapidity.

Quite different was the use which in 1870 the French Army, not subjected to a long peace training in the use of a quick-firing and long-ranging arm, made of the Chassepot: their fire was opened at enormous distances, partly indeed without the enemy being really in sight. The latter certainly suffered hereby considerable losses, even at great distances; but a substantial result was never obtained by this sort of fire. It is not intended to enter here on the burning question of the advantages and disadvantages of mass-fire at long ranges. It may, however, be asserted that the above-mentioned practice of the French did not arise from clear reflection and calculation, but from deficient fire-discipline and from hazy ideas as to the real value of the arm.

After the Franco-German War, the employment of mass-fire at long ranges became often the subject of theoretical treatises and practical trials in the great armies of Europe, but while the arguments for and against were still being warmly debated, and while no definite decision as to the new arrangement of fire-tactics (which in any case had now become necessary) had yet been arrived at, the question was settled in Turkey out of hand without many preliminary investigations, and most important consequences were derived from the armament with long-ranging and rapidly-firing rifles.

At the commencement of the present war the Turkish Army brought out a system of fire-tactics quite complete in its simplicity, viz., as soon as the enemy was known to be within range, the ground which he was supposed to occupy, or over which he was expected to advance, was swept, without regard to distance, or to probability of hitting, or to the expenditure of cartridges, with a fire the violence and duration of which may be said to have been hitherto unheard of.

Hand in hand with these fire-tactics goes the application of field fortifications, employed not only to an extent, but in a manner, not previously seen.

The Turkish tactics of the present war rest therefore on two, to a certain extent, new factors, and although many well-founded objections may be raised to the mode in which they were applied in detail, and many rational improvements may be proposed, yet it is impossible to wholly ignore the claims of these new factors, and their powerful influence on every rational new system of tactics.

Let us begin with the active factor of Turkish tactics. Experience has proved the falsity of all the tactical objections often raised formerly against the possibility of such a rapid fire.

The new complicated breech-loading systems have strikingly proved their serviceableness in the field even in the hands of untrained men. Magazine rifles, too, which were formerly entirely rejected as a weapon of war, have been handled without difficulty, and finally, the supply of the ammunition expended in incredible quantity, was managed on the Turkish side without any difficulty. The Turks were certainly favoured in this last particular by the circumstance that they stood almost always on the tactical defensive, but even in the few cases where the Turkish infantry carried out great offensive movements the good organization of the ammunition trains, which extended their operations up to the fire-line, were noticeable. In nearly all the

Turkish positions captured by the Russians immense stores of cartridges were found, often placed in flat boxes for convenient use between the riflemen. It was nothing unusual to find beside Turkish dead bodies in captured shelter-trenches 200–300 empty cartridge-cases: cases have been even verified where in the course of a battle single Turks have fired away up to 500 cartridges. Even in the cases where Turks advanced to attack Russian positions it has been proved that Turkish soldiers who had established themselves in front of the Russian position, have fired away then in comparatively short time 120–150 shots. The necessary corroboration of these statements is supplied by the assertion of the Russians that they captured in the course of the war in conquered positions, and in the various capitulations, in all 500,000,000 cartridges. In connection with this, it may be mentioned that the war supply of a German army corps, including the ammunition columns, consists in round numbers of 4,500,000 cartridges.

Further, the fact should not be overlooked that the distances on the ground in front of the Turkish positions were often paced and marked.

We now turn to the passive factor of the Turkish tactics—the employment of field fortifications. Here we have to deal with two things closely connected with one another, but to be considered separately—the construction of regular entrenchments and the establishing on and holding fast of ground by means of hastily made shooting-trenches.

When Turkish infantry takes up a tactical position, it tries at once to obtain cover in an extended line, using as far as possible whatever materials are to be found in the neighbourhood, and if necessary excavating a shallow shelter-trench. Where the ground permits, several infantry lines entrench themselves behind one another at short intervals on a more or less inclined slope, so as to obtain two or more tiers of fire. The Turkish infantry seems to possess great dexterity in the establishment of these shelter-trenches; the first construction, often only a slight one, is effected with great rapidity. Technical troops are never employed on this work.

If time permits, the originally shallow trenches are deepened and the breastwork strengthened; if the position remains occupied for several days, traverses against enfilade fire are constructed in the shelter-trenches, and by means of sloping excavations under the counterscarp cover is obtained for part of the garrison which, as long as the defenders of the shelter-trench are not actively engaged, is thus better protected from the enemy's fire.

It may be noted as a very appropriate arrangement that numerous vessels of water are placed in the shooting-trenches, and that in many cases single trenches are completely supplied with provisions, so that the defenders are not driven by hunger, and particularly by thirst, to temporarily abandon their posts. On the Russian side this occurred several times, the result being in some instances decisive tactical disadvantage, in all useless losses.

In taking up a position to be held for a considerable time, the defensive lines described above are strengthened by redoubts, placed on the highest points of the position and armed with artillery; they serve particularly to flank the shelter trenches.

In the general disposition of a defensive line, care is generally taken, and mostly with great skill, that a forward line, if it fall into the hands of the enemy, shall afford no cover against the still occupied lines in rear.

Having thus spoken briefly in general terms of the two new factors of modern warfare, mass-fire and field entrenchments, we now turn to a short consideration of the tactical employment of the various arms.

3. *The Infantry.*

The Russian infantry which appears on the European theatre of war, has regiments of 3 battalions of 5 companies each; the 5th company of each battalion bears the title of "rifle company," and is specially intended for fighting in extended order: its arms and training are, however, the same as those of the line companies. The Guard regiments have 4 battalions of 4 companies each; a rifle battalion has 4 companies. A battalion formed up for attack, forms usually from 4 company columns, two lines, a short distance apart, the 5th (rifle) company is extended in front. A regiment formed for attack has generally 2 battalions alongside each

other, in the formation just described, the 3rd battalion as reserve in rear in battalion-mass.

As is sufficiently evident, from the descriptions of the various fights, there is no preparation or introduction of the attack by musketry fire to speak of, this introduction is generally left over to the artillery.

The attack, usually commenced at a great distance (1,000 paces or more), is generally conducted in this way. The chain of skirmishers and both the ranks formed of company columns, often also the reserve in battalion masses, advance almost simultaneously, with small intervals, and in advancing come together, so that under the most favourable circumstances the attacking force reaches the enemy as a disorganized swarm.

If the first rush does not bring the attacking troops up to the enemy, they try to find cover and open a heavy but mostly nearly ineffective fire; tactical order is then in great measure lost, tactical leading becomes very difficult, often impossible; and, for the most part, fresh reserves must be sent forward to bring the line which has thus come to a stand into motion again.

The attacks are almost always directed frontally against the enemy's position, attempts to turn one or both flanks of the opponent are of rare occurrence.

In the defensive, the Russian infantry often proceeds too early to a counter-attack, without beforehand making full use of that rapid fire, which, if rightly employed, is so destructive at shortest ranges; the pursuit, also, of the repulsed enemy is sometimes carried out with the bayonet where firing would be much more efficacious.

The mode of fighting of the Turkish infantry on the defensive has been already referred to in the foregoing general remarks on the Turkish fire-tactics; besides, a steady holding back of, and, for the most part, a skilful employment of, the reserve, is noticeable: on the offensive, which also hurls a terrible hail of bullets before it, and is carried out by a very thick chain of skirmishers, followed closely by small bodies with closed ranks, and at greater distances by larger bodies, the evident aim is to direct the principal attack (taking advantage of the ground), on a flank of the enemy. In most cases, the advancing infantry has larger or smaller bodies of cavalry on the wings.

With respect to the above-mentioned relatively increased importance of field fortifications as compared with former times, and particularly in view of the trench work which is often executed in the course even of the fight, a point in the equipment of the infantry comes more prominently into the foreground than formerly, viz., entrenching tools.

In the combats which have been described, the deficiency of entrenching tools on the Russian side is often painfully prominent; although this disagreeable fact is partly explained by the fact that the Russian infantry soldier threw away, as a troublesome burden, the entrenching tools he carried; yet, apart from this, the equipment of the Russian Army with entrenching tools does not seem to satisfy the demands of modern warfare.

In order to secure the presence of the necessary entrenching tools at the decisive moment, three plans may be followed: (1), by the distribution of technical troops; (2), by carrying the materials on train waggons and giving them out to the troops in case of need; (3), by a permanent equipment of the infantry with entrenching tools.

In consequence, on the one hand, of the great extent to which rapid field fortification is now and will continue to be employed; on the other, of the peculiarly close connection of this trench-work with the tactical employment of infantry, the distribution of technical troops seems to be a quite inadequate means of carrying out these works. The proposal, made by a voice from the Russian Army, to equip one company of each regiment with entrenching tools, and to compensate this company for its increased load by indulgences in other respects—in other words, to attach a pioneer company to each regiment, and thus enormously to increase the technical troops—would, apart from many other disadvantages, fail to answer the desired purpose.

To carry the entrenching tools on waggons, and only to distribute them to the infantry shortly before the beginning of a fight and to take them back afterwards,

is quite impracticable; it only remains, therefore, to permanently equip infantry with such a quantity of entrenching tools as to satisfy the requirements which are now felt in the course of a battle; a sufficient reserve of tools must, of course, also be carried on waggons to fill up deficiencies and for the execution of larger works outside the actual fight. The infantry, in all purely tactical trench-work, has to keep itself, as far as possible, independent of the co-operation of technical troops; the Turkish infantry, in spite of its manifold deficiencies, has shown that this is possible.

Although voices from the Russian Army are raised against the permanent distribution of tools to the infantry, on the ground that the load is too heavy and that they would be thrown away, yet these apprehensions might be rendered groundless, by, on the one hand, a judicious construction and mode of carrying the tools, and on the other, by properly instructing the men and giving them examples of the value of the equipment.

As a matter of fact, the Russians before Plevna were deficient in entrenching tools.

The compiler, unfortunately, does not know what quantity of tools were in immediate possession of the troops; it must, however, have been excessively small.

In the beginning of September, at the commencement of the great artillery attack, when batteries had to be constructed for over 100 guns, advanced shooting trenches to be made, and cover farther in rear obtained for 6 divisions, there were given out to the troops from the field engineer park, in round numbers, about 2,000 articles of entrenching equipment, of which about 1,600 were small spades and the rest about half large spades and half picks. And this formed the greater part of the material present; for Skobeleff's 3 brigades, which received none of the tools thus distributed, had hardly any.

It may be mentioned, by way of comparison, that apart from the entrenching tools with the cavalry, the artillery, and the trains, a German corps of 25 battalions has, at its immediate disposal for purposes of field fortification, about 5,000 small spades, 3,000 large spades, 1,000 picks, and 2,500 hatchets and axes. The 5,000 small spades and part of the hatchets are always carried by the infantry.

4. *The Cavalry.*

Various adverse criticisms, which have been made from several quarters, and not without reason, on the unsuccessful employment of the Russian cavalry in the first period of the campaign, lay particular stress on this unsatisfactory employment of the cavalry being the more incomprehensible, that the Russian cavalry was not only comparatively strong as compared with the other arms, but also had a great numerical superiority over the weak Turkish cavalry. Both these assumptions are, however, inaccurate.

At the beginning of the war, the proportion of cavalry to infantry in the active Army was one to six, which is about the normal proportion in the German Army, and can be called certainly sufficient, but not extraordinarily large.

The reinforcements which entered the theatre of war during the course of the operations which have been treated of—10 infantry divisions, with at least 100,000 men, and the Guard cavalry and Cossacks, with at most 8,000 men—alter this proportion much to the disadvantage of the cavalry. Further, it is altogether unjust to speak of a great numerical superiority of the Russian over the Turkish cavalry. The so-called regular Turkish cavalry consisted, certainly only of 8,000 men, but 20,000 Tcherkesses formed, not only the most numerous, but decidedly the best part of the Turkish cavalry. The numerical proportion of the Russian and Turkish cavalry can, therefore, be taken generally as equal, at the commencement rather in favour of the Turks, later on rather in favour of the Russians.

With the exception of the Guards, which have a separate organization, the whole Russian cavalry of the line, together with the 20 embodied Don Cossack regiments of the first category, is, according to the latest regulations, formed permanently into 15 divisions:—14 divisions of 1 dragoon, 1 uhlan, 1 hussar, and 1 Cossack regiment, and 1 division of 4 Cossack regiments. Two Cossack regiments were not attached to divisions. The formation of larger bodies of cavalry had been refrained from in consequence of the experiences of the German Army in 1866 and 1870–71. The

divisions were intended to act independently, and were tactically formed to this end. The service of the infantry divisions was to be provided for by the regiments of the Don of the second or even of the third category (20 regiments) who were not attached to divisions.

But these principles were soon deviated from. At the beginning of hostilities the 15 cavalry divisions were assigned to the 14 Army Corps (formed each of 2 or 3 infantry divisions) and to the Grenadier Corps, so that each cavalry division became a part of the corps; and thus the independence and the power of strategically employing the cavalry divisions, which had been originally aimed at, was much interfered with.

At the beginning of hostilities the Army includes 7 cavalry divisions, attached to the same number of army corps, also a Caucasian Cossack brigade and 10 regiments of Cossacks of the Don of the second category, which latter belong to no particular division or corps, and are told off for the service of the infantry divisions.

Immediately after the crossing of the Danube, by a really wanton breaking up of the divisional formations, an entirely new large body of cavalry is formed, the advanced guard corps of General Gourko, destined for the crossing of the Balkans. This corps consists, besides the Cossack brigade of the Caucasus, of three combined brigades, the dragoon brigade, formed of the dragoon regiments of the 8th and 9th division, the so-called combined brigade containing the hussar regiment of the 9th division, and a regiment of the Don of the second category, and lastly a Don brigade consisting of two regiments of the second category.

Of the 10 regiments of the Don of the second category, which originally were without the cavalry organization and were told off to act with the infantry, 3 regiments are thus otherwise employed; there remain available for 14 infantry divisions only 7 Cossack regiments. This is evidently much too little; and in consequence a great part of the regiments belonging to cavalry divisions are taken away from the body to which they belong and attached to various infantry divisions and brigades. The cavalry divisions now soon disappear even in name, and their commanders take, according to their rank, the command of mixed bodies of troops.

In the middle of September a great cavalry corps is formed under Krylow to shut in Plevna on the west side.

The strategical task of this corps was a manifold one: it had to watch the Army of Plevna, to reconnoitre the country towards the west and south, and to meet any relieving force advancing from these directions, as far as possible from Plevna.

It is plain that in a duty of this sort, which necessitated a tolerably permanent division of the corps into several parts, its cumbrous mass-formation must have caused difficulties to the leader, even if he had been more energetic and judicious than actually was the case.

Two or three independent cavalry divisions, receiving direct from the Commander-in-Chief of the Western Army their prescribed tasks for a certain number of days, would have been, perhaps, more capable of fulfilling the end aimed at by the Commander-in-Chief.

In the idea of stopping a threatened attempt at relief from the south or west by cavalry alone there lies indisputably an over-estimation of the fighting value of cavalry alone (without infantry support); and although the retreat of Krylow before the advancing Turks, almost without striking a blow, cannot be considered as justifiable under the circumstances, yet it is hard to conceive that cavalry could eventually have succeeded in keeping an infantry corps of 10,000 men at a distance from Plevna.

From no fact and from no order can the intention be gathered of supporting Krylow's corps at the right time by infantry. The tasks, however, assigned to the German cavalry in 1870–71 never required of it to carry out a decisive combat against large masses of hostile infantry.

In connection with this, the following observation is not without foundation.

From the whole conduct of Osman Pacha at Plevna in July and August, the Russian leaders might have formed the conclusion that Osman's Army was not capable of carrying out a vigorous offensive movement, and all the Russians had to desire, therefore, was to induce the Turks by any means to leave the fortifications of Plevna and fight in the open.

Now, if in the beginning of September, the Russian Army of the West had been stationed not eastward but westward of Plevna, with two strong bridge heads on the right bank above and below Plevna somewhere about Mediwen and Rybina, and 4,000 or 5,000 cavalry been sent to watch the east side, the following state of things would have been presented.

No relieving army coming from the westward (from Widdin) or from the south (from Orchanie), and from these directions only was the advance of such an army to be expected, could unite with the Army in Plevna without having beaten the Russian Army; but the latter (leaving out of the question the strength it would have derived from proper entrenchments and from its far superior cavalry) was strong enough numerically to resist even a simultaneous attack of the relieving Army and the Army of Plevna.

If Osman, on the other hand, should try to avail himself of this disposition of the Russian Army of the West to make a sudden march eastwards and threaten the line of the Jantra, there was the highest probability that he would be overtaken by the main body of the Russian Army of the West before even reaching the Osma, and compelled to fight a battle in the open under very unfavourable circumstances.

Returning now to what actually happened before Plevna, the blockade on the west side only became effective after General Gourko took the command there, and also after very considerable masses of infantry were made available to support the cavalry.

Throwing a glance, in conclusion, on the tactical employment of the cavalry, we are struck by their excessive employment of the dismounted mode of combat. The modern *rôle* of cavalry will often bring them into situations where they must fight on foot, and for this reason they must be trained accordingly; but dismounted fighting is, and always must be, for cavalry a little-to-be-desired makeshift, opposed entirely to the nature of the arm.

It is not so with the Russian cavalry: here the dismounted combat has become a veritable mania; it is employed almost on every occasion, and without any cogent reason. The cause of this lies, without doubt, in the peace instruction of the Russian cavalry, which seems to lay exaggerated importance on the dismounted combat; for it must certainly be called exaggerated when more than once during the great manœuvres in the year 1876 whole regiments of cavalry dismounted to attack a post, and when considerable towns possessing an infantry garrison were stormed by cavalry.

The dragoons are still a good deal looked on in Russia as a body meant to fight in two ways, just as in the time of the Emperor Nicholas, who sought to realize his idea of the Centaur-like union of infantry and cavalry by the grand but unpractical creation of his dragoon corps. This creation of a dragoon corps proved itself in its first practical trial—the Eastern War—to be a complete failure, but its fundamental idea, certainly in more modest limits, is yet maintained in the Russian Army.

The dragoon regiment which belongs to every normally formed Russian cavalry division represents, in a measure, the infantry element of this division.

The dismounted combat of the Russian cavalry is an essential factor of its activity, that of the German cavalry is only a resource in case of need; the ideal Russian cavalry division is a combination of the three arms, capable of employment for any sort of fighting and endowed with great rapidity of movement; the German cavalry division is before everything cavalry only, and is expected to do its utmost as such, while, as a single arm, it must naturally give up all claim to independence in battle.

This latter arrangement conforms better than the other to the law which, in all departments of labour, is becoming more fully recognised, of the distribution of labour, and of the thereby increased capability of the whole.

To this fundamental distinction between the Russian and German cavalry, a number of peculiar occurrences in this war, of a tactical as well as strategical nature, may be attributed, which, in our opinion, are striking and in part startling.

5. *Artillery.*

The Russian field artillery is armed with breech-loading guns of two calibres; the so-called 4-pounder has a calibre of 8·7 centimetres, weight of projectile about

11 lbs., weight of barrel 614 lbs.; the limber of the 4-pounder holds 18 cartridges, and to each gun belong two ammunition waggons. The so-called 9-pounder has a calibre of 10·7 centimetres, weight of projectile 22 lbs., weight of barrel 1,250 lbs.; the limber contains 12 projectiles, and each gun has three ammunition waggons. Both Russian calibres are therefore greater than the corresponding German ones in weight of projectile as well as in weight of gun; the weight of the projectile of the 9-pounder is little inferior to that of the German 12-centimetre gun. The whole field artillery has wrought-iron carriages.

All the guns have teams of six horses; the foot artillery has batteries of eight guns, and consists half of 4-pounders and half of 9-pounders; the horse artillery has only 4-pounders, and has batteries of six guns.

To each infantry division is permanently assigned a brigade of six batteries (Nos. 1, 2, 3, 9-pounders, Nos. 4, 5, 6, 4-pounders), *i.e.*, 48 guns, or four guns to a battalion, rather more than with the normal strength of a German army corps. Two horse batteries, with twelve guns, belong to each cavalry division.

In view of the great numerical superiority of the Russian over the Turkish artillery, one would have expected that their influence would have been very perceptible in battle, and that their fire would have effectively prepared for and supported the attack of the infantry, but little of such a preparation is observable; most of the fights give the impression that the co-operation of the artillery had no influence worth mentioning on their whole progress.

The cause of this is to be looked for in two directions: 1. In the way in which they were tactically employed; 2. In the material effect they produced, which did not satisfy the claims made on them in this war.

If we cast a glance on the tactical employment of the artillery in the combats which have been described, the following points are to be marked:—

1. The batteries present are from the beginning distributed almost regularly along the line of battle; there is no holding together of a part of the artillery for combined action on a fixed point of the line of battle after the manner of our corps artillery.

2. Fire is opened at very great distances, and almost always frontally, against the enemy's position; an endeavour to enfilade this never appears; an exceptional example of this is the position taken up by the artillery on the 10th September, under instructions from Skobeleff, on the east side of the Tutschenitza Gorge, for the partial enfilading of the Turkish position on the "Third Hill."

3. The Turkish artillery, always far inferior numerically to the Russian, generally gives up very soon its opposition to the Russian artillery, and retires into covered positions; and as soon as the Russian infantry advances to attack, comes into play again quite ready for fight.

4. The frontal position of the Russian artillery generally necessitates the cessation of its fire at the commencement of the infantry attack.

5. Cases in which batteries follow the infantry in their attack and try to support them in the forward positions they have taken are only exceptional; usually the artillery remains in its original positions, and during the second part of the fight quite retires into the background, while in this second period the far weaker Turkish artillery is generally very active. An energetic advance of the artillery to support the infantry attack hardly ever takes place, except under Skobeleff's leadership: further examples of the sort are furnished, on the 20th July, by the battery assigned to the Kostroma regiment, and, on the 30th July, by some batteries of the Russian left wing, under Schachkowski.

The batteries, which advance with the infantry within range of the enemy's rifle fire, suffer besides such a loss in men and horses, that they become generally in a short time entirely or partially incapable of action.

Turning now to the material effect of the fire of the Russian artillery, the combats described, with the exception of Telisch, on the 28th October, afford no example of a really successful working.

The Russian artillery only finds opportunity in a few cases to fire on uncovered troops; its fire is generally directed on infantry lines behind natural cover, against shooting trenches, or against more or less regular entrenchments, and here is almost entirely without effect. In spite of a preparation of several hours by the fire of a

powerful body of artillery, the infantry attack almost always encounters an unshaken adversary.

The small effect of the Russian field artillery, in the battles of July and August, on the covered and entrenched Turkish positions, had so strongly shaken the confidence of the troops in their field artillery, that to prepare for the great attack on Plevna, in September, twenty 24-pounders were brought up from the siege park, but even these did not achieve even a tolerably satisfactory result.

The first opening of fire takes place, on an average, at 2,400 mètres, at which distance the 4-pounder is considered useless, and only 9-pounders and heavy guns are employed. After approaching within 1,600 mètres of the enemy's position, a few 4-pounder batteries take part in the cannonade. The result of this cannonade, carried on for several days with great energy, and to which the Turks in general only feebly reply, is almost null, if one does not count the damage to the Russian gun-carriages—a certainly very negative and questionable result.

The effect of the fire of 60 guns, directed concentrically against the redoubt of Gornjia Dubnjäk, on the 24th October, can hardly be considered satisfactory; one would have expected that such an overwhelming fire—60 guns to 4—would in a very short time have broken all resistance. Instead of this, the garrison of the redoubt, after enduring for several hours this apparently terrible fire, was in a condition to repulse several attempts at storming, made by superior numbers.

The capitulation of the redoubt of Telisch, on the 28th October, is the only success which can be entirely set down to the credit of the artillery.

In the supposition that, in the future, extensive field fortifications will probably play the same part as in the present Russo-Turkish War, the following demands will probably be made on the artillery:—

1. A part, and not too small a one, of the field artillery must consist of guns of considerably heavier calibre than has hitherto been assigned to field artillery, in order to sufficiently destroy the enemy's cover from long distances.

2. The light field artillery (and for this the smallest calibre hitherto employed, the 8-centimetre gun, is amply sufficient) must seek its sphere of usefulness, not in positions in the rear, but in direct co-operation with the attacking infantry. The light artillery must partly immediately accompany the attacking infantry in small fractions (even a couple of guns may, at the right spot, produce great effect), partly in larger bodies by skilful and bold manœuvring, direct a heavy fire, though it be only of short duration, on some especially important points of the enemy's position.

Acting in this way, great losses in men and horses (under some circumstances, even the loss of guns) will be unavoidable, and the responsible leader, if he will gain decisive results, must not shrink from such contingencies.

A battery which has maintained a destructive fire at a decisive point for five minutes, one minute even, and then is lost, has done more for the general good than ten batteries which, from well chosen positions in the rear, have kept up a well-aimed but, after all, a nearly ineffective fire.

6. *Fortifications and Field Works.*

Ardahan, Nicopolis, and Kars, fortresses equipped with a numerous artillery of heavy calibre, succumb to attack by storm; the field fortifications of Plevna, only constructed after the enemy came in sight, and partly under his fire, and for the armament of which only a comparatively small number of guns of small calibre is available, holds out for nearly five months, and is eventually only reduced by hunger. This contrast presents itself involuntarily at the head of the series of reflections which the present war calls forth on the subject of the disposition of fortresses.

Certainly, Ardahan, Nicopolis, and Kars fell so quickly, not because, but although they were real fortresses; Plevna made such a resistance, not because, but although it was only defended by field works; and, finally, these cases only prove anew the old principle, that a fortress only derives its value and importance from the troops which defend it. Nevertheless, it is not to be denied that, in the present war, field fortifications, as compared with fortresses, have played a more important part than formerly, and that this will probably also take place in future wars. In theory, fortifications and field works have the same end—to form, with the employment of

all available means, as strong a position as possible; the distinction only lies in the means available in the various cases.

The limit of these means is only fixed, in the construction of fortresses, by economical reasons, in the construction of field works by the various circumstances of the case, among which the time available plays a principal part.

Naturally, all the points of a country, which under any possible circumstances may become the foci of the war, cannot be beforehand converted into fortresses. This is impossible, not only from regard to the consideration of expense, but also for many other reasons, military and civil; only such places as have, under all circumstances, a permanent strategical value can be so treated; those permanent fortresses form only a defensive outline, and it is left to field fortifications to fill this in according to the requirements of the war in progress.

The great improvements in arms, as also the great increase and improvement of means of transport as compared with former times, which permit of the rapid bringing up of comparatively heavy artillery and of the extensive supply of ammunition, cause greater demands to be made than formerly for the construction of fortifications. These demands can be easily satisfied in time of peace by the construction of fortresses, with the application of all available technical appliances, if only money is obtainable; but in the construction of field fortifications, time will always, and the available labour will generally, be limited, and it has therefore to be considered what preparatory measures will serve to facilitate the rapid establishment of suitable field fortifications in a given moment.

These measures may be divided into two groups, intellectual and material.

To the first category belong the preparation in peace time of defensive schemes of all points which, in certain contingencies, may become of importance in war, and the training of the troops (not the technical arms) in the construction of large fortifications. The material measures consist of the supplying the army with a sufficient quantity of entrenching tools, and finally, of the preparation of all the timber constructions required for such works, such as blockhouses, powder magazines, gun platforms, blindages, bridges, ramps, and barracks, which should be stored in pieces in the great fortresses ready for issue.

NOTICES OF BOOKS.

Almanach für die k. k. Kriegs-Marine. 1878. Edited by the Conductors of the "Mittheilungen aus dem Gebiete des See-wesens." Pola. 12mo. Size $5\frac{1}{2}'' \times 3\frac{1}{2}''$. Weight $5\frac{1}{2}$ oz.

We observe from the title page that this is the third year of publication of this useful and handy little volume. As we made its acquaintance in its previous issue, we can say that it has been greatly improved, and that the improvements have not added very much to its bulk. Now that both the Austrian and German Empires have become such important maritime powers, any publications relating to naval affairs which appear in either country are entitled to careful notice at the hands of British Officers; and the size, portability, and amount of information which this almanack contains give it a very high place amongst the many works which we owe to the pens of both German and Austrian naval Officers. A great deal of it is naturally taken up with matters chiefly concerning the Austrian Service, but still it contains a mass of facts useful and interesting to the Officers of every Navy in the world. In the first place the "get up" of the book cannot be too highly commended. It is literally a pocket-book, and can be carried in the pocket without any inconvenience.

It is printed on very thin, and at the same time excellent, paper. The type is small and also exceedingly clear; the graduation of type for headings and titles is in itself first rate. There are some fifty blank pages at the end, a pencil loop on one cover, and a small pocket on the inside of both. We recommend the type and paper to the notice of Captain Bedford should his own admirable pocket-book be reprinted. In some respects the little almanack before us resembles that useful work. Being a periodical publication, it of course deals much with passing affairs, but still there is much in it which will long continue to be of value. The first part contains several pages of rules and mathematical formulæ for navigation, nautical astronomy, gunnery, naval architecture, and marine engineering. In the second part are details of the guns in use in the different navies of the world. The third part contains lists of the fleets of all the maritime powers, with the size, armour, armament, speed, and designation of each particular ship of any importance. In the number before us this part is illustrated with plans and sections of the newer and most noteworthy vessels. There are also tables of the weights, measures, and moneys of different countries. Indeed, to the end of the third part, or about one-half of the book, it may be regarded as combining much of the information contained in Captain Bedford's "Sailor's Pocket-book," and Mr. King's "War Ships of Europe," reviewed in a previous number of the Journal. The remaining parts, IV and V, are occupied with the regulations of the Imperial Royal Navy, and complete lists of its active and retired Officers. C. B.

Die Marine. Von Kontre-Admiral BROMMY und Fregatten-Kapitän H. VON LITTROW. Third edition, arranged with respect to present progress and enlarged, by Ferdinand von Kronenfels. 8vo. Vienna: Hartleben, 1878. Price 14*s.* 6*d.* Weight 3½ lbs. Size 10″ × 7″.

THIS is another of those books published abroad which are of such interest to naval Officers. The works of Marchal and King, both foreigners, on recent war ships, are exclusively devoted to the consideration of questions of construction and of matters connected with dockyards and machinery. The work before us, though a considerable portion of it is occupied with descriptions of the newest classes of ships of war, both armoured and unarmoured, is more extended in its scope. It attempts to present the reader, whether lay or professional, with a complete picture of the Naval Service. Appealing as it does, therefore, to a class of readers larger in number than the ranks of the Navy, either national or mercantile, could supply, it is written in a more popular and less technical style than most books of a similar character. A great deal of it is certainly quite worthy of being read merely for its own sake, and not because of any special instruction which it may be expected to convey. The first edition was published thirty years ago; and the present—the third—may be regarded as substantially a new work. There can be no doubt that the most important chapter in it, that which comprises accounts of the more noteworthy ships built within the last few years for the navies of the world, and which is equal in length to about a quarter of the whole book, is entirely new. The extensive tables at the end of foreign fleets and guns are new also and are very valuable. The first chapter is headed "The Sea," and contains a short essay upon marine physical geography. The colour, saltness, composition, gravity, and temperature of the sea are all considered in order; as well as the motion of waves, the nature of currents, tides, winds, &c. This is followed by a description of the instruments, such as the compass, log-line, chronometer, and sounding-lead, used by mariners. The second chapter gives us a short historical sketch of shipbuilding down to the introduction of steam, and explains many of the terms and processes of naval architecture. The system of construction employed in building both mercantile and foreign ships is put succinctly and clearly before the reader, who can hardly fail to derive much assistance from the really admirable illustrations with which the explanation is accompanied. The next chapter, called "The Ship's Fabric," describes in detail the several parts which make up the frame or hull of a vessel of any particular class. From this we pass to a series of chapters on the rigging and fitting out of ships, and

the systems of equipment employed for various purposes of service, and upon the organization and special duties of the different ranks of Officers and men composing the *personnel* of the Navy. After these comes the chapter which we have designated the most important in the book, viz., the one headed "The floating *matériel* of the "Fleet," which deals with the several classes of modern war ships, no matter for what country they have been constructed. The other chapters having to do with what more particularly concerns the countrymen of the authors and editors can have, naturally, but an indirect interest compared with that which this lengthened description of many of our own vessels will be found to possess for Officers of the English Navy. Not only will they here find a vast amount of information concerning ships in which, perhaps, they may have actually served; but, owing to the number of foreign vessels described, they will have ample and ready means of comparison of the one with the other. Short of an actual conflict, we know of no other way in which the relative merits of two such vessels as, say the English "Alexandra" and the Austrian "Tegetthoff," can be estimated, if it be not by a careful study of the facts concerning them, which the book we are noticing brings so conveniently together. The whole chapter is enriched by a perfect wealth of illustration which even in professional works of the kind is unusual: there is not a Navy of any importance, not a class of ship of any fighting power, which is not represented by at least one excellently drawn plan or sketch. The other departments of warlike efficiency are not neglected, and several pages are taken up with detailed descriptions of the many systems of torpedoes, which we owe to the inventive genius of such men as Lay, Whitehead, and Ericsson. The remainder of the book is occupied with notices of the work in dockyards and arsenals, and the service afloat in harbour and at sea. An interesting chapter on a naval engagement contains an account of two typical battles—Trafalgar fought in the days of sailing wooden ships, and Lissa in these modern ones of ironclads and steam rams. The history of Tegetthoff's victory is well told, and will certainly amply repay perusal. The tables at the end are numerous and important. First we have the "Complement Lists" of ships in the German and in the Austrian Navies. We would direct the attention of English Officers to these suggestive statistics. They show how wide is the difference between the proportion of non-combatants to combatants in our own and in foreign services. There next come tables of the dimensions, power, &c., of the Krupp, Russian, French, Woolwich, Armstrong, and Whitworth systems of ordnance. After these are tolerably complete navy lists of all nations. We have already spoken of the richness of illustration, which is a feature of the work; and we may add that twelve free-hand pictures of ships—several English amongst them—are not its least attractive feature. A valuable glossary, containing about 2,000 sea expressions, is also amongst the supplementary matter at the end, and should be of great use to students of foreign nautical terms. The merits of the work are considerable, and we doubt if anything equal to it has yet been published. C. B.

History of the Indian Navy (1613–1863). By CHARLES RATHBONE LOW, Lieutenant (late) Indian Navy, F.R.G.S. Author of "The Life of F.M. Sir George "Pollock, Bart., G.C.B., G.C.S.I.;" "Tales of Ocean;" "The Land of the Sun." &c. 2 vols., 8vo. London, 1877. Price 36*s*. Size 9″ × 6″. Weight 4 lb. 4 oz.

IN two stout octavo volumes Lieutenant Low has attempted to relate the history of the distinguished, and now extinct, service in which he held a commission, and in which, as he tells us, "some of the best years" of his life were passed. His modest and interesting preface will be found to contain a summary of the motives by which he was impelled to undertake the work of recording the deeds of the Indian Navy, alike in war and in peace, throughout its long and honourable career of exactly two centuries and a half. He has endeavoured to erect a monument of its achievements throughout that lengthened period, similar in design to that which we owe to the patience and accuracy of the historian James, of the glories of the Royal Navy during the quarter of a century which began with the epoch of Lord Howe's victory

on the 1st of June, 1794, and ended with Lord Exmouth's attack on the city of Algiers. The result is that he has produced the most important *naval* book which has appeared in this country for many years. He seems, to some extent, to have taken James as his model; and though—as we feel sure he himself would readily admit—he has fallen far short of his distinguished predecessor in the field of naval history, yet, wielding as he does an able and practised pen, and being personally conversant with many of the details of his subject, his labours may be said to have been eminently successful. In the preparation of his work he was confronted by an extraordinary difficulty. At the present day, anyone who should undertake to narrate the story of some great department of the public service, with a career extending down to our own times, would almost certainly find that his chief embarrassment lay in the enormous wealth of materials which he would have to sift and examine before drawing upon them for his facts. If any reader at any time tried to estimate the labour of drawing an accurate picture of, say, the Royal Navy since the Battle of Navarino down to the date of the expedition to Abyssinia, and have realized the shifting condition of the Service throughout that period, he may be able to form some idea of the vast mass of documents, manuscripts, and printed matter which he would have to wade through. Yet even this would probably shrink into insignificance in comparison with the mountainous pile of evidence which the historian of the 250 years of the Indian Naval Service, corresponding with, and reporting to at least a double set of masters, local and at home, would have to weigh and summarize. This obstacle was removed from our author's path. He suffered, incredible as it may seem, from what he pungently terms "an act of "Vandalism," "the destruction of the public records of the Indian Navy." Mr. Clements Markham, whom he quotes, has said in another place ("Memoir on the "Indian Surveys," London, 1871, p. 5): "It has been difficult to bring together a "record of the marine surveys in consequence of the destruction of documents." That he has triumphed over so unexpected and strange a difficulty is much to Lieutenant Low's credit.

It is strange that the history contained in these volumes should be so seldom thought of or so little known by the fellow-countrymen of the gallant spirits who laid the foundations, and erected the early structure of the great fabric of British power in India. More than a century before Clive's victory at Plassy the valiant seamen of the Company's vessels had been winning a name for their country and themselves by their enterprise and daring in the distant regions of the East. In 1607 a ship of the Company, the "Hector," first anchored in an Indian port, that of Surat; and the first Englishman to represent the great Association of Merchants at the Mogul's Court was the "Hector's" Captain, Hawkins. Hostile and piratical natives of these far-distant shores, as well as rival traders from other European countries, had to be withstood; and as a result of frequent contests with the former and with the Dutch and Portuguese, the Company determined to "equip their "vessels for fighting as well as for trading purposes." These armed ships were the predecessors of the Indiamen, whose brilliant actions with enemies' ships continued down to a date within the present century,[1] and of the "Bombay Marine," or fighting force, under the immediate orders of the Government of Bombay, which eventually came to be designated the Indian Navy. It is with the story of the latter that Lieutenant Low exclusively deals.

After some brilliant conflicts, against apparently overwhelming odds, with the heavy ships of the Portuguese, the Company's Officers obtained permission to establish regular trading factories at Surat and other places. These it was necessary to protect by some organized force against all aggressors. "Hence," says our historian, "was formed the nucleus of the service that developed, first into the "Bombay Marine, and ultimately into the Indian Navy. . . . . In this year, "1613, when the Indian Marine was first formed, the Company had not a single "European soldier or sepoy in their pay." The permanent establishment of the local Marine, we are told farther on (p. 24), may be dated from the year 1615. Previous

[1] Mr. W. S. Lindsay, "History of Merchant Shipping," vol. ii, Appendix 11, gives a list of these actions.

to the acquisition of Bombay, in the reign of Charles II, the head-quarters of the Marine had been at Surat; and the force had been compelled to acknowledge the superiority of the Dutch in the neighbouring waters. But the splendid harbour of Bombay had not long fallen into possession of the Company when the force was transferred to it and rapidly increased in power. It soon had an opportunity of distinguishing itself against the famous Sivajee, the founder of the Mahratta power in India. The trade of the new settlement had been found to be so exposed to the depredations of the armed boats of this chieftain and of the Malabar pirates, that the local Officers applied to the Court of Directors in England for permission to construct three armed vessels to convoy the merchantmen trading to the Gulf of Persia and the Red Sea. The directors assented to this request, and appointed as their shipbuilder at Bombay Mr. Warwick Pett, a descendant of the celebrated Sir Phineas Pett, the constructor of several famous vessels of our early Navy. Mr. W. Pett was directed to proceed to Bombay and construct two ships, and thus began that course of shipbuilding, for the Royal and Indian Navies, which continued down to the middle of the present century. Lieutenant Low gives us, (vol. i, p. 298), some striking evidence of the strength and excellent construction of these Bombay-built ships, by instancing the case of the "Salsette," a frigate which was beset by ice, when, with five other ships of war and a convoy of twelve merchantmen, she was leaving the Baltic in the winter of 1808–9, and alone escaped shipwreck. The list of ships built by the eminent Parsees, Jamsetjee, Nowrojee, and Cursetjee for the Royal service (given at p. 4 of vol. ii), is, we fancy, incomplete, the name of Her Majesty's ship "Meeanee" being omitted from it. Not only did these ships excel in strength, but, we are informed (vol. ii, p. 10), that an 84-gun ship could be constructed at Bombay for 21,000*l.* less than in England.

Soon after the transfer from Surat to Bombay the service "became officially "known as the Bombay Marine. An Officer was regularly appointed for the year "as Admiral, and others were detailed for duty under his orders, the supply being "kept up by drafts of Officers and men from the ships arriving from Europe. "During all these years they had been employed in the suppression of piracy as far "as their limited strength permitted, in the protection of Bombay, and also, in con-"junction with the squadron stationed at Surat, in conveying the ships trading with "the Persian Gulf and Red Sea, and the ports on the Malabar coast; these duties "were most arduous and taxed their limited resources to the utmost, but they were "fulfilled with ardour and success, and the service gained the approval and thanks "of its masters. During the wars waged by this country with European Powers—"the Portuguese (before their separation from Spain), the Dutch, and the French—"this Marine service had often to struggle against superior maritime forces, but "they bore the flag of their country not without credit, and earned the respect "alike of European rivals and native enemies; indeed, as we have shown, the "grants of the early privileges of the Company were mainly won by the prowess of "their seamen." (Vol. i, p. 91.)

One of the most important chapters in the long history of the Company's Navy is the protracted struggle, lasting nearly half a century, with the hereditary pirate chiefs, to whom our countrymen gave the name of Angria. The power of this corsair dynasty was not finally broken until the year 1756, when a powerful fleet, under Admiral Watson, of the Royal Navy, and Commodore Sir William James, of the Bombay Marine, with several hundred troops on board—the sepoys commanded by Clive—attacked and reduced its chief stronghold. Lieutenant Low states (vol. i, p. 123) that an official uniform was first given to the service in the year 1761. If so, it must have adopted one almost at the same time as the Royal Navy, whichever of the two legends of its institution (either that of the king's admiration of the blue and white riding-habit, laced with gold, of the Duchess, whom he passed in the Park, or of Lord Anson's appearance at Court in the same colours) we think fit to give credence to. A difficulty in manning the ships seems to have been often felt, and occasionally the crews had to be "maintained at their necessary "strength by drafts from the jails." This was a difficulty experienced in the kindred service at home, and one which, we are ashamed to have to say, was often solved in the same way.

Throughout its long career the Indian Navy seems to have been constantly employed on active service, against European enemies, the dreaded pirates of the Indian and Arabian coasts, and the native rulers of India over whose territories the great Company was extending its dominion. Its struggles with pirates were apparently almost incessant; and Lieutenant Low gives us an account of a remarkable manœuvre which the crews of the Company's cruizers were drilled in, with the express view of repelling piratical boarders. This was called "forming lion's "mouth," and closely resembles a manœuvre, which, under a less startling name, we have often seen practised on board a ship of Her Majesty, commanded by a distinguished Officer who had seen much of the Indian vessels of war on actual service. In the second American War the Honourable Company's brig "Nautilus" maintained a gallant but unsuccessful conflict with a greatly superior American vessel, the "Peacock." The circumstances of this combat, well known to the readers of James, have been told with greater accuracy and fuller detail by Lieutenant Low, who supplies the further information that the brave man who commanded the "Nautilus," Commander Boyce, though terribly wounded, was alive and in excellent health last April. Unfortunately, since the publication of the work under review, this interesting relic of a heroic age of naval history has passed away, his death having occurred since the beginning of the present year.

The Bombay Marine took part in the first Burmese War, and a few years after that contest, "on May 1st, 1830," says Lieutenant Low (who gives a copy of the Government order (see vol. i, p. 532), though Mr. Markham, in the officially published "Memoir on Indian Surveys," p. 12, and again on p. 13, says the date was 1832), it became the Indian Navy, a designation by which it has since been always known. The Indian Navy fought in company with the ships of Her Majesty at Aden, in China, in the second Burmese War, and in the second and third China wars, when it performed always distinguished service; and its gallant deeds during the Sikh wars and in the Indian Mutiny obtained for its Officers and men much commendation at the time, commendation which, as our author shows only too clearly, was forgotten when the rewards came to be distributed. The treatment of this gallant service seems to have been, to say the least of it, ungenerous in the extreme; and amongst the benefits which a young naval Officer is sure to derive from a perusal of this valuable book, not the least will be the example therein given of the devoted resignation with which the brave men who officered the Indian Navy continued to perform their hazardous and exhausting duties, without a hope of those honorary recompenses, which is almost all a martial service can look for at the hands of its masters.

But the brilliant performances of the service in war were rivalled by the deeds of its members during peace. For so small a body it counted amongst its Officers an exceptionally large number of admirable surveyors. "The war services of the "Indian Navy, as well as the beneficial and enduring results of its repression of "piracy and the slave trade," says Sir R. Murchison, "are well known. These "services have been varied, honourable, and useful; but in the eyes of geographers "the wide-spread and lasting utility of the excellent surveys made by Officers of "the Indian Navy hold an equally prominent place." Mr. Clements Markham is equally strong in his praise, and speaks ("Memoir, &c.," p. 4) of the "noble "succession of surveyors," produced by the Bombay Marine. It has been the fate of this honourable service, so distinguished in every path open to naval men, to have been left long unrewarded and finally to be somewhat contemptuously abolished; and, perhaps harder still, to be confounded with those local services, such as the Bengal Marine, with which it had nothing in common but allegiance to the same masters and employment afloat. The book before us has done much to get justice done it, and we can honestly commend it to naval Officers. Unfortunately it has a serious defect: it has not got that useful appendix, an index.—C. B.

Royal Engineers' Prize Essay, 1876.—*The Attack of Fortresses in the Future.* By Captain T. Frazer, R.E. Printed for the Royal Engineer Institute, 1877. Price 4*s.* 9*d.* Weight, under 1 lb. Size, 10″ × 6¼″ × ¾″. Pp. 102.

ALTHOUGH the Germans, in the war of 1870–71, besieged and took many towns, it is commonly remarked that, owing to the antiquated nature of their fortifications, and the usually feeble resistance offered by their garrisons, few data were afforded for the conduct of the actual siege of a modern fortress.

Of the preliminary operation—the investment—Paris and Metz afford examples from which military men may draw many lessons; neither are the subsequent operations against Strasburg and Belfort so wholly uninstructive. For, although the great development of siege works due to the large area of modern fortresses was not called for, yet they afford good data for estimating the power of modern siege artillery, and have brought into prominent light its powerful attribute of distant breaching power.

Although principles remain the same, yet so enlarged is the sphere of siege operations since our last national experience that, were we called upon to undertake them to-morrow, we should undoubtedly have much to learn on the spot which it would be better to know beforehand, and that this fact is patent to both artillery and engineers is proved by the attention which both these arms of the service have, for the last two or three years, been giving to the subject, evidenced, as it is, by the existence of committees still at work, and by the fact that each corps has, within that period, allotted the subject for its Prize Essay.

Captain Frazer, for a second time the prize essayist of his corps, has, with the above heading as his text, produced an essay which combines the two qualities of pleasant reading and valuable reference.

Of a necessity he draws his deductions from the Franco-German war, and enters, at more or less length, into the rather numerous technical details which are called for by the conditional sub-heads of the essay.

Into all these it is not our intention to follow him, noticing only those which are of general, and we may perhaps add, of national interest.

After briefly touching upon the various processes to which a hostile fortress may be subjected, viz., blockade, assault, masking, and bombardment, we reach the most interesting pages of the essay in those which treat of investment as preliminary to regular approach.

There is perhaps no problem which requires more systematic skill than the complete investment of one force by another. To non-military minds it is a continual puzzle, why a force should ever allow itself to be invested, and once invested, why it should not be able, by sheer weight, to break through its enemies' extended lines, wherever and whenever it pleases.

In the first place, an unbeaten and active force or garrison can rarely be invested without a great preponderance of numbers on the investing side, such as the Russians have been forced to bring to bear on Plevna. A beaten army, on the contrary, demoralised and unfit for exertion for some few days after its defeat, will awaken to find itself engirdled with entrenchments, the construction of which it should at all hazards have disputed, and this possibly by a force little, if at all, exceeding its own strength. Such was the French case at Metz.

Again, the investment of many fortresses is simplified by the very means from which they derive their strength, such, for example, as inundations, which, though forbidding attack, demand but slight investment.

The great size of modern fortresses, and the large area commanded by their artillery, has of necessity increased the length of investment lines, and this, at first sight, would appear to be a distinct gain for the defence; but, as is well pointed out in the essay, it is not a wholly unmixed blessing, and, like all the results of modern science in warfare, acts and reacts impartially on both attack and defence. For, while greater extension of investment lines must mean a less depth of troops to defend them, it also implies a greater distance for the besieged to pass over before delivering his attack, which is thus shorn of the very elements most necessary to its success, viz., secrecy and suddenness, while, on the investing side, the breech-loader gives power of retention until the telegraph has summoned reserves.

Again, turning movements are of necessity denied to the besieged, whose attack must be frontal, with an ever-increasing exposure of his flanks.

But perhaps what most militates against the success of ordinary sorties is, as Captain Frazer puts it, "the cheerless task of coming out to go back again." It is no wonder if even the best troops show an occasional tendency to anticipate the hour of their recall.

Hard work indeed will fall to the lot of the engineers in these early days of a siege. They will have on their hands many technical duties in connection with the actual lines of investment, the repairs and maintenance and construction of new and existing lines of communication by road, river, railway, and telegraph, added to the collection and parking of the great bulk of stores required for the further prosecution of the siege.

We have no battalions of pioneers, and our weak force of engineer companies will have to draw largely on the intelligent co-operation of their brethren of the infantry to accomplish work which modern warfare does not admit of being left undone.

Passing from the investment period to that of the regular siege, the points which naturally call for the closest attention are the modifications necessitated by modern artillery.

A comparison of our proposed siege train with those of Russia, Prussia, Austria, and Italy, shows our weight of metal to be above the average, accompanied by a greater variety of ammunition, both perhaps questionable advantages where ease of transport and simplicity of stores are desirable.

Our siege train is, even as regards the guns, in a somewhat tentative stage, still more so as regards the carriages and their accessories, which, perhaps even more than the guns themselves, are affected by modern progress.

Popular interest in England, readily awakened in all that pertains to our field and turret guns, is somewhat torpid as regards the intermediate order of siege artillery, a fact due possibly to our insular position and the absence of such incentives as are offered by the border fortresses of continental nations.

We have during the last twenty years constructed fortresses, both at home and abroad, perhaps unsurpassed by those of any other nation, but still fortresses and all to do with them command little national sympathy; they are rather regarded with a jealous eye, as involving unremunerative expenditure and wounding national vanity by hinting at the possible vulnerability of our naval line of defence.

It is scarcely strange, then, that while any supposed defect in our field or naval guns deeply stirs the national mind, our siege and garrison artillery is slowly working its way to perfection unnoticed and uncared for.

Again, in these days of manœuvres the arm of the service which can derive least professional benefit as a whole is probably the engineers, whose destructive and constructive tendencies are of a necessity almost wholly quiescent, or forced for umpire purposes into ludicrous imitations of reality, little instructive to the army at large, and somewhat wounding to the self-respect of those who have year after year to carry them out. Moreover, siege and garrison artillery as such have never as yet taken any part in our annual manœuvres.

A maritime Plevna on Dartmoor or elsewhere, with a month's investment and siege, would not only be a taste of such work for the army at large, but would probably do more to supply artillerymen and engineers with the necessary data to meet each other's requirements than many a ream of official foolscap.

It is on these two arms of the service that the brunt of technical siege work naturally falls, and when called for it is work that must be done both well and quickly under almost certain difficulty.

Such a case naturally calls for experience as its most important element of success. Duet singers may, it is true, practice apart, but a joint rehearsal is apt to improve the concert.

And that some such rehearsing is necessary will readily be gathered by any reader of that part of Captain Frazer's essay which treats of siege batteries and their accessories. Nearly thirty pages are devoted to this subject alone, and are full of statistics and suggestions for meeting difficulties both present and prospective.

Again, as we near the fortress and the engineers' especial arts of sapping and mining are brought into play, the ever-recurring suggestions in the essay bring the

same idea to mind, that more extended practice than that offered by pure instruction in the oft-tortured fields of Chatham would, by combining the presence of a large number of Officers with the advantage always accruing from change of scene, go far to solve outstanding questions, and perhaps lead to the detection of errors where none are supposed to exist.

In Captain Frazer's summing up of the necessary conditions for success in siege operations technical knowledge holds a place, and rightly so, but a siege-trench is no place for the theorist, and the technical knowledge must be of that reliable type into which early training does not always blossom unless matured by practice.

S. W.

Des Marches et des Combats. Par le Général Berthaut. Première Partie. Marche en Avant, Combat Offensive. Second Edition. 1 vol. Paris: Librairie Militaire de J. Dumaine, Rue et Passage Dauphine, 30. 1877. Price about 2*s.* 6*d.* Size $7\frac{1}{2}'' \times 4\frac{3}{4}'' \times \frac{3}{4}''$. Pp. 224. Weight under 10 oz.

The first edition of this work was published anonymously in 1875. This edition bears its author's name. It is an excellent little treatise, and deals concisely both with principles and details.

The War Correspondence of the "Daily News," 1877–78. Continued from the fall of Kars to the signature of the Preliminaries of Peace. 1 vol. London: Macmillan and Co., 1878. Price 10*s.* 6*d.* Size $7\frac{3}{4}'' \times 5\frac{3}{4}'' \times 1\frac{1}{8}''$. Pp. 599. Weight just over $1\frac{1}{4}$ lbs.

The second of the two volumes of this work.

The Officer's Memorandum Book for Peace and War. Compiled by Lieutenant-Colonel R. Harrison. Second Edition. Revised and corrected. London: C. Kegan Paul and Co. London, 1878. Price 3*s.* 6*d.* Size $4\frac{3}{4}'' \times 3\frac{1}{2}'' \times \frac{1}{2}''$. Pp 124. Weight under 4 oz.

This book is as it were a skeleton of notes put together by Colonel Harrison, to be further enlarged and added to by any one who may use it. It does not profess to be exhaustive.